



SAN GORGONIO PASS Wind Energy Project

Draft Environmental Impact Statement

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT



NOTICE

This draft environmental impact statement should be retained to be used in conjunction with the final environmental impact statement. The final statement will incorporate this document by reference and include the modifications and corrections which should be made to the draft as a result of public comment. The final statement will also include a record of public comments on this draft and response to those comments.

BLM LIBRARY
RS 150A BLDG. 50
DENVER FEDERAL CENTER
P.O. BOX 25047
DENVER, CO 80225

NOTE TO REVIEWERS:

Due to printing delays, all maps and color simulations will be sent under separate cover on or about May 10, 1982.



ID 88645333

TJ
825
S26
1982
V.1

SANG
.67
DES

DEPARTMENT OF THE INTERIOR
DRAFT
ENVIRONMENTAL IMPACT STATEMENT
ON THE
SAN GORGONIO PASS
WIND ENERGY PROJECT

PREPARED BY

BUREAU OF LAND MANAGEMENT
DEPARTMENT OF THE INTERIOR

Ed Hunter

STATE DIRECTOR, CALIFORNIA STATE OFFICE

BLM LIBRARY
RS 150A BLDG. 50
DENVER FEDERAL CENTER
P.O. BOX 25047
DENVER, CO 80225

Bureau of Land Management
Library
Bldg. 50, Denver Federal Center
Denver, CO 80225

DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

IN COOPERATION WITH
CALIFORNIA ENERGY COMMISSION AND
CALIFORNIA PUBLIC UTILITIES COMMISSION

DRAFT ENVIRONMENTAL IMPACT STATEMENT
ON
SAN GORGONIO PASS
WIND ENERGY PROJECT

This Draft Environmental Impact Statement (DEIS) analyzes the environmental consequences of seven proposals to construct and operate large-scale wind turbine fields on approximately 12,780 acres of public land in the San Geronio Pass located northwest of Palm Springs, California in Riverside County. The proposed wind farms would include turbine installations, several transmission lines to collect power and interconnect into the local power network, the installation of new substations, and construction of access roads to support system requirements. In addition to these proposals one application has been received for the right to wind access across public lands.

Alternatives to the proposed project include: development on public lands except where significant surface conflicts exist and no action.

Major environmental issues are related to aesthetics, threatened and endangered animal and plant species, bird migration, changes in land use, socioeconomic, noise and communications interference.

Comments on this DEIS must be received by ~~JUN~~ 6 1982

For further information and the location to which comments must be sent contact:

William D. Payne, Team Leader
Bureau of Land Management
California State Office
2800 Cottage Way
Sacramento, California 95825

Commercial Number: (916) 484-4541
FTS: 468-4541

MAY 1982



SUMMARY

INTRODUCTION

Five private developers, one utility and a major city have applied to the Bureau of Land Management (BLM) for rights-of-way to utilize public lands for the development of large-scale wind energy systems. These systems would be constructed and operated by Windfarms Ltd, U.S. Windpower, Southern California Edison Company, PanAero Corporation, San Gorgonio Farms, Inc., the City of Riverside, and Smart and Company on approximately 12,780 acres of public land surrounding the San Gorgonio Pass in Riverside County, California. Power generated by the wind farms would be fed into the Southern California Edison utility grid, and would service customers in the Los Angeles metropolitan area.

The actual acreage needed for the construction of turbines, access roads, and transmission lines would be considerably less than applied for, as filings have been made by the applicants to protect and safeguard wind access to wind turbine generator sites. An additional applicant, Natomas Energy Company, has filed only for wind rights on 775 acres of public lands.

At full development the electric generating capacity of the wind energy proposals would be:

<u>Applicants</u>	<u>Installed Capacity (Megawatts)</u>	<u>Power Output (million kWh/yr)</u>
Windfarms	244.0	631.0
U.S. Windpower	137.5	475.5
Southern California Edison	105.5	245.7
PanAero	390.5	1,163.5
San Gorgonio Farms	17.8	59.2
City of Riverside	20.0	69.0
Smart	24.0	144.0
Natomas Energy Company	0.0	0.0

Because a number of developers have filed competing applications (overlapping) for the same area, no combined energy total is given.

PURPOSE AND NEED

The purpose of the wind energy project evolves from a national and state need to develop alternative energy sources. The projects would harness the previously untapped energy producing potential of the San Gorgonio Pass region, an area with the capability of providing one of the Nation's most productive wind generating sources. Development of the wind resource would help meet, in part, the forecasted need for power by the year 2000 in California, reduce dependency on oil and gas for generating electricity, furnish access to the economy energy market, and enhance utility system flexibility.

SCOPING

In accordance with the National Environmental Policy Act of 1969 and implementing regulations of the Council on Environmental Quality, the Bureau, in cooperation with Riverside County, held several "scoping" meetings during April 1981 to present the proposed project to the public for comment and review. Participants at these meetings identified seven major issues of concern:

1. Aesthetics: Wind turbines would be highly visible due to their size. The San Geronio Pass area has been rated by the BLM as having a relatively high visual sensitivity based on high use volume and user attitudes.
2. Safety: There is a remote chance that a blade could separate from a turbine and be thrown some distance. Other safety concerns include the relatively slight possibilities of tower collapse, aircraft and electrical safety.
3. Noise: Both the construction and operation of turbines would create noise. While operational noise is not expected to be loud, problems associated with experimental turbines have arisen occasionally in the past, most notably the "thumping" sounds produced by the MOD-1 turbine in Boone, North Carolina.
4. Electromagnetic Interference: Wind turbine blades can cause interference with microwave beams, local television, FM radio and two-way radio transmission, and VORTAC signals.
5. Ecology: Birds may collide with the turbines. Development of wind parks may fragment or destroy the habitat of the Coachella Valley Fringe-toed Lizard, listed as a Federal threatened and State endangered species.
6. Land Use: Wind turbine development may effect or preclude other uses of these public lands, including agriculture, recreation and wilderness uses.
7. Wind Access and Equity: Successful wind development demands a supply of wind at a given velocity, direction, frequency and duration. Obstructions upwind of a turbine, including other turbines, can reduce this supply if placed too close together. Turbines placed too close to a downwind property line may obstruct some of the wind supply on the adjoining property.

ALTERNATIVES INCLUDING PROPOSED ACTION

ALTERNATIVE 1: APPLICANTS PROPOSED ACTIONS

Windfarms

Windfarms, Ltd. of San Francisco would construct sixty-one wind turbine generators on 8,332 acres of public lands and 845 acres of private lands. Two types of wind turbines are being considered for the project. These are the Boeing MOD-2 WTGs rated at 2.5 MW and the Hamilton Standard rated at 4.0 MW. The turbines would be built in four phases between 1983 and

1990. The proposed wind farm would be located on the hills to the north of the pass (Whitewater Canyon) and in the Whitewater River floodplain outside Palm Springs. The project would require approximately sixteen miles of new road and ten miles of underground transmission lines to interconnect the wind turbine generators.

U.S. Windpower

U.S. Windpower of Burlington, Massachusetts proposes the development of a wind farm consisting of 2,750 turbines located on 3,600 acres of public lands. The 50 kilowatt USW 56-50 turbine would be sited in three phases: Whitewater Canyon (900 machines), Whitewater Hill-Windy Point (350 windmills) and the Whitewater River floodplain (1,500 turbines). Construction would occur between 1983 and 1987. Approximately 55 miles of road and 54 miles of overhead transmission lines would be required to connect the wind farm to the utility grid.

Southern California Edison

Southern California Edison has applied on behalf of six developers to construct six wind parks on 2,800 acres of public lands. These developers would include Boeing, Bear Sterns/Bendix, WECS Tech, U.S. Windpower, Westinghouse, and Ventus. The Boeing wind park would consist of five 2.5 MW MOD-2s. Bear Sterns-Bendix proposes construction of five 4.5 MW turbines north of Whitewater Hill. WECS Tech would construct 55 100-kilowatt turbines on Whitewater Hill. The U.S. Windpower proposal would correspond to a small portion of their separate proposal described above (100 machines). Westinghouse would erect sixty 500-kilowatt turbines in the Whitewater Floodplain northwest of Palm Springs. Ventus would also place 200 towers mounting 800 37.5 kilowatt turbines in the floodplains. Construction would begin in 1983 and be completed in 1985. Approximately 25 miles of roads and 30 miles of underground transmission lines would be required.

PanAero

PanAero Corporation would construct a total of 309 wind turbines on 9,270 acres of public lands. Three turbine types would be used: the 4.0 MW Hamilton Standard, the 500-kilowatt Westinghouse, and the 500-kilowatt DAF Indal. Four facilities would be constructed: Desert Hot Springs (109 turbines), Whitewater Canyon (112 turbines), Seven Palms Valley (63 turbines) and Cathedral City (25 turbines). Construction would occur between 1983 and 1990. Approximately 29 miles of roads and 28 miles of overhead transmission lines would be required.

San Geronio Farms

San Geronio Farms, Inc., of San Pedro, California, would construct 95 wind turbines on 280 acres of public lands near Whitewater Hill. These turbines would be erected in three phases beginning with the construction of sixty 25-kilowatt J. Carter machines. The second phase would incorporate thirty 125-kilowatt J. Carter turbines, and the last phase five Boeing MOD-2s. Construction would begin in 1983 and be completed in 1986. Approximately six miles of new road and transmission lines would be required.

City of Riverside

The Public Utilities Department for the City of Riverside proposes the construction of eight MOD-2 generators on 360 acres located north of San Geronio Pass. Construction would occur in three phases between 1983 and 1989. Approximately four miles of new road and three miles of underground transmission lines would need to be built to support WTG siting.

Smart and Company

Smart and Company of Hermosa Beach, California would construct twelve 2 MW Merckham wind turbines on seventy acres of public lands on top of Windy Point. Construction would occur in five phases, beginning in 1983 and finishing in 1986. Approximately one mile of road and one mile of overhead transmission line would be required on public lands.

ALTERNATIVE 2: DEVELOPMENT ON LANDS EXCEPT THOSE WITH SIGNIFICANT SURFACE CONFLICTS

This alternative would allow development on public lands except for those areas which have been identified as having resources extremely sensitive to development. These lands include a compilation of sensitive habitat for wildlife, fragile slopes (over 25 percent) and visual resource values. Parcel boundaries and development restrictions (such as turbine size and setbacks) would mitigate adverse impacts of the proposed action (Applicant's proposed actions).

On noncompetitive parcels where only one applicant has applied for a right-of-way, a grant would be issued on that basis. Where two or more applicants have applied for the same area, award of a right-of-way grant would be by modified-competitive bid as described in Chapter 1. The power output available at full development for each of the eight applicant proposals after application of environmental constraints would be as follows:

<u>Applicants</u>	<u>Installed Capacity (Megawatts)</u>	<u>Power Output (million kWh/yr)</u>
Windfarms	57.5	335.6
U.S. Windpower	56.1	203.8
Southern California Edison	23.9	64.1
PanAero	163.0	717.2
San Geronio Farms	2.5	8.4
City of Riverside	17.5	60.4
Smart	0.0	0.0
Natomas Energy Company	0.0	0.0

ALTERNATIVE 3: NO ACTION

No wind energy development would be allowed. Management on public lands would continue under the guidelines of the California Desert Plan (BLM, 1980).

MAJOR ENVIRONMENTAL CONSEQUENCES

ALTERNATIVE ONE: APPLICANT'S PROPOSED ACTIONS

Land Use

Three miles of the Pacific Crest Trail (PCT) would be subject to impact: one mile in the Devils Garden area, one mile just north of Whitewater Hill and one mile where the trail's surveyed route crosses the floor of the pass north of Windy Point. The trail would not be blocked, but the size and density of machines would dominate the recreation experience. No safety setbacks would be provided.

Turbines would be constructed on approximately 2,000 acres of public lands which have been proposed by the City of Palm Springs for inclusion in a Whitewater Regional Park. Impacts would range from the construction of a small number of very large turbines, to the installation of closely packed rows of hundreds of small machines. While access into these parcels would not be restricted (except for the SCE-Ventus proposal), the recreation experience of large numbers of sunbathers and off-road-vehicle users who now use the area would be dramatically altered. The lack of access restrictions may also result in an increase in vandalism and minor inadvertent damage to wind facilities.

While no wind development would be allowed in that portion of the Whitewater Wilderness Study Area that has been recommended as suitable for wilderness designation, some development would be allowed within that portion of the WSA which has been recommended as non-suitable. Development could not occur until such time as the area is declared non-suitable by Congress. Development would affect several ridges in the southern part of the WSA, an area of approximately 200 acres. Siting of WTGs would degrade wilderness values and preclude future designation as wilderness.

Visual Resources

Wind development would have a significant visual impact on the existing landscape character. Generally, impacts would result from removal of vegetation and soil disturbances associated with construction of wind tower pads, access and service roads, electrical transmission lines and the introduction of a variety of wind turbine structures.

Development on and north of Alta Mesa would range from small groups of large turbines to extensive arrays of small turbines, all highly visible from Interstate 10. The siting of these turbines would result in serious line and color contrasts due to numerous roads, transmission lines and dense arrays. Other more serious impacts would result from the single rows of large and medium turbines which would run north from this area along the crest of prominent ridges.

Significant impacts would result from turbine construction north of Whitewater Hill. In the sensitive Devils Garden region, color and line contrasts would result from cuts and fills on steep slopes and removal of vegetation in this relatively undeveloped area. Side casting would create strong color and line contrasts on unstable slopes. South of Painted

Hill, impacts would be less severe, due in part to the high level of development already present in this area, although turbines on top of Painted Hill would be highly visible and dominant.

On Whitewater Hill, significant impacts would result from the variety of turbine types proposed. Although small-scale development exists on the Hill, the structures would dominate the landscape, with contrasts ranging from moderate to strong for the large machines to strong for the smaller turbines (due to their great density). The density would create a strong "clutter" effect on this highly visible landmark.

Development in the Whitewater floodplain would create a strong impact on the visual resource. Contrasts would range from moderate-strong (large machines) to strong (small machines). Development of large arrays of medium and small turbines would result in a solid wall of structures; when viewed from residential areas and major routes of travel, the form, line and textural contrasts would create strong clutter and disorder.

Development on Windy Point, a prominent natural landmark, would create strong form, line and color contrasts, dominating the area.

Development in the Edom Hill area would have a moderate to strong impact on the characteristic landscape of the region. Although there are already a number of powerlines, communications facilities and off-road vehicle tracks in this area, wind development would be visually co-dominant to dominant due to the scale of the machines and the clutter effect create by the mixture of machine types proposed.

Safety

No setback requirements from public roads and utilities have been proposed, thus providing no buffer zone in the event of machine collapse or blade throw.

Localized desert pavement destruction would occur as a result of construction. This could result in a slight worsening of flood hazard potential and downstream sediment deposition. Changes in natural drainage courses could also increase channel erosion in the Whitewater Floodplain.

Biological Resources

Biological resources, particularly wildlife, could be affected by wind energy developments in many ways. Particularly sensitive in the San Geronio Pass area would be birds, bighorn sheep, and the threatened Coachella Valley Fringe-Toed Lizard.

The potential exists for low incident rates of collision between birds and wind turbine generators. This would be especially of concern in two areas: near the Whitewater Settling Ponds and on the ridge crest east of lower Whitewater Canyon. Migratory birds using the ponds could collide with the dense arrays of turbines proposed immediately adjacent to the ponds. The large turbines on the Whitewater Canyon crest pose a potential collision threat for soaring birds and migratory birds utilizing the riparian areas on the floor of the canyon. Placement of large turbines along ridgetops may impact the behavior of large soaring birds which utilize air currents deflected upwards by the terrain as a source of

lift. This is of particular concern to the east of Whitewater Canyon. The presence of turbines near high quality riparian areas may divert birds to lower quality areas.

The Coachella Valley Fringe-Toed Lizard has been federally listed as threatened and state listed as endangered. The lizard spends most of its time within three inches of the surface, therefore it is very vulnerable to crushing and other direct impacts from turbine and road construction.

Noise induced hearing losses, both from construction and operation, would increase the lizard's vulnerability to predation. Lizard habitat could be fragmented by road construction on public lands. These impacts would occur mainly in the Whitewater Floodplain area, where most of the lizard habitat in the study area occurs. There is also a possibility that wind turbines could interfere with sand transport and deposition, a mechanism upon which the maintenance of lizard habitat depends. The most damaging proposals would be those with large numbers of turbines requiring extensive roading systems, specifically Ventus, Westinghouse, U.S. Windpower and PanAero.

The presence of machines may force Desert Bighorn to retreat up to one mile from the nearest turbines in the North Whitewater area. This impact could be especially true for the highly visible strings of large turbines on top of the ridges north of Alta Mesa.

Noise

Noise from construction of turbines would attenuate to ambient levels within one mile of the construction site and to below county standards within one-half mile. General operational noise may be a problem for the community of Bonnie Bell from development north of Alta Mesa, and from the development of large turbines in the Whitewater Floodplain just north of Palm Springs. A "thumping" sound could be a problem for nearby residences from large turbine developments in the Whitewater floodplain and on Windy Point where large down-wind turbines are proposed.

Communications Interference

Turbines would interfere with microwave beams in the area north of Alta Mesa, on Whitewater Hill, and in the Whitewater Floodplain.

Wind turbines may interfere with television reception by causing visual distortion. Interference would occur only under specific conditions where the blades of the turbine direct a reflected signal to the receiver. The siting of large turbines could impact up to nine sections of public and private land. This impact should not be significant, however, because of the lack of residential development in these areas. Medium size turbines would potentially interfere with reception up to one-half mile. Few or no impacts would occur from small turbines.

Impacts on FM Radio reception would be similar to television for weaker stations and insignificant for stronger ones. Some interference with two-way radio communication is possible. No impact on VORTAC signals are anticipated.

Cultural Resources

Overall, impacts on prehistoric or historic sites are expected to be minimal. Development may threaten some Native American locations of significance. Whitewater Canyon and the Devils Garden have both been identified as zones of highest ethnographic significance; Whitewater Hill and Windy Point have also been identified as being of some significance. All have at least one development proposed.

Social and Economic Conditions

Impacts on employment, housing and tourism would not be significant for any proposals.

Property tax revenues from each of the proposals are listed below. In addition, 50 percent of the revenues to BLM from these developments would be passed directly to the State of California which may, in turn, pass this share on to the county.

<u>Applicant</u>	<u>Estimated Annual Property Tax Revenue</u>
Windfarms, Ltd	\$3.5 million
U. S. Windpower	\$4.2 million
Southern California Edison	\$3.8 million
PanAero	\$8.9 million
San Geronio Farms	\$1.0 million
City of Riverside	\$0.0 million
Smart	\$0.9 million

Effects on utility rates are not likely to be enough to be noticeable from any of the developments.

ALTERNATIVE TWO: DEVELOPMENT ON LANDS EXCEPT THOSE WITH SIGNIFICANT SURFACE CONFLICTS

Impacts would be essentially as described under Alternative 1 above, with the following exceptions. Application of mitigation would eliminate all impacts on microwave transmission and television and FM radio reception. Impacts on land use, visual resources, wildlife and socioeconomics follow.

Impacts on land use would be similar to those described for Alternative 1 although somewhat less severe due to the lower level of development permitted. Only about 1,000 acres of the Whitewater floodplain would be developed (a reduction of about 50 percent), reducing impacts on the proposed park. Turbines would be constructed along two-thirds of a mile of the PCT only, and a 1 1/4 blade diameter safety easement would be provided. Development would still occur within non-suitable portions of the Whitewater WSA, precluding future designation in those areas.

The severity of impacts on visual resources from road, turbine and transmission line construction would vary. Transmission lines and roads would in many cases meet the objectives of the area's visual units. However, development of more than a few turbines in any one location would still create visual contrasts. In most parts of the study area, the

scale or density of turbine arrays precludes mitigation of contrasts by screening; camouflage would not be entirely successful in every case. However, in most areas the contrast and dominance of the turbines would be at a moderate level which would be very close to acceptable standards. Alternative 2 developments would be distinctive, but would respect the characteristics of the landscape, and would not impair the overall visual resource quality. Such distinctive visual landmarks as Whitewater Hill, Windy Point, and the southern slopes of Alta Mesa would have development curtailed or eliminated. Impacts would remain highest in the comparatively less visible area north of Alta Mesa, where most proposed development would be allowed due to the high wind potential of the area. Limiting development in the Whitewater floodplain would eliminate the impact of overhead lines, and reduce the impact of other windpark components to moderate contrast levels. Facilities in this area would be co-dominant with other features of the landscape. Although development near Edom Hill would be visible from the Palm Valley area, views from Palm Springs and Thousand Palms would be limited. Moderate contrasts/dominance would be created, but the area's visual objectives would be met.

Impacts on biological resources would be similar to those described for Alternative 1, but would be generally less due to the overall lower level of development. No turbines would be constructed on the east rim of lower Whitewater Canyon, eliminating the potential impact on migratory and soaring birds. Bird collisions with turbines near the Whitewater settling ponds would probably be reduced owing to restrictions on development immediately adjacent to and within the pond. About 50 percent less Fringe-toed Lizard habitat would be affected; however, impacts of noise would remain and the effect on sand transport and deposition remains unclear.

Impacts on employment, housing and tourism would not be significant for any of the proposals.

When fully developed, property tax revenues to the county would range between \$2.7 million and \$4.4 million dollars, depending upon which applicants developed which parcels.

ALTERNATIVE THREE: NO ACTION

Future effects on resources within the study area would depend upon alternative land uses approved for the area. Most resources on public land would not be significantly affected by continuation of present management. The future visual environment would likely be characterized by the retention of major visual features (i.e. mountain slopes and Whitewater Canyon) with a gradual fragmentation of the valley floor as a visual unit with scattered, low-density residential development. The overall effect would be significantly less severe than the wind development.

UNRESOLVED ISSUES AND AREAS OF CONTROVERSY

Certain controversial issues, which could have a direct bearing on the implementation of the applicants' proposal or alternatives have not been resolved. Additional analyses of these issues will provide new data for determining potential project impacts and will identify areas where agencies other than BLM have integral consultation or regulatory roles.

The following is a list of unresolved issues, the agency responsible, and the date by which the issue is expected to be resolved.

1. Threatened and Endangered Species: BLM is in the process of formally consulting with the U.S. Fish and Wildlife Service regarding possible impacts on the threatened Coachella Valley Fringe-toed lizard. A biological opinion has not yet been received; in the interim BLM will not take any action which would make an irreversible or irretrievable commitment of resources which would foreclose the consideration of modifications or alternatives to the proposed action. Should the biological opinion, when received, indicate that the action will likely jeopardize the continued existence of a listed species or result in the destruction or adverse modification of its Critical Habitat, the proposed action will be modified or abandoned, as appropriate. The procedures being used are in compliance with BLM Manual Section 6840 and the Endangered Species Act. The biological opinion from USFWS is expected in July 1982.
2. Floodplain Restrictions: Portions of the applicant's proposed sites would be located in the Whitewater Floodplain. Past floods along the tributaries of the Whitewater River have caused severe damage to property in both Cabazon and Palm Springs. A number of flood control improvements have been constructed to protect property in the basin. Potential flood hazards to the WTG sites from a 100-year flood have not been determined in accordance with Executive Order 11988. BLM will coordinate with the Corps of Engineers and the Riverside County Flood Control District to insure that development plans are in compliance with County of Riverside Ordinance No. 458 which regulates the construction of facilities within a floodplain.
3. Bird Migration: The potential for collisions between birds and wind turbines is largely unknown. Current evidence suggests that effects on migrant bird populations should be minimal, but additional information is needed to fully assess the cumulative impact of development. Studies in this area are currently being supported by Southern California Edison and are scheduled for completion in the fall of 1982.
4. Wilderness Study Areas: Proposed siting of WTGs in North White-water Canyon would traverse both suitable and non-suitable portions of Wilderness Study Area 218. Development could not occur until such time the area is declared non-suitable by Congress.

IDENTIFICATION OF THE BUREAU OF LAND MANAGEMENT PREFERRED ALTERNATIVE

Alternative 2 is the Bureau of Land Management preferred alternative. This alternative would allow competitive and non-competitive right-of-way grants on public lands in the San Geronimo Pass for the development of wind energy resources and electrical power generation. From 45 to 103 megawatts of installed capacity would be provided from six competitive parcels and another 78 megawatts from four non-competitive parcels. A maximum of 850 million kilowatt hours of electrical energy would be generated for power consumption. This energy could provide electricity for 121,000 homes in the southern California area, saving approximately \$52 million per year in imported oil costs.

The issuance of grants to proceed would be consistent with the principals and procedures of 43 CFR Part 2800 (pursuant to the Federal Land Policy and Management Act of 1976) and the goals and objectives in the California Desert Plan. It is the policy of the Bureau to provide access and availability to public lands for the exploration, production, and utilization of its energy resources.

Under Alternative 2, development would be allowed to proceed on a majority of the area under application. Most of the applicants would be eligible to develop their projects within the Pass, subject to the results of the modified-competitive bid process. Therefore, a variety of approaches encompassing a number of wind turbine technologies for utilizing the area's wind resources would be provided. In addition, the alternative's development restrictions would help protect the Pass's unique and sensitive resources, including its visual landmarks, recreation opportunities and wildlife. Wind development would also be regulated to prevent interference with communication facilities and adequate measures would be provided to avoid or minimize hazards to the public health and safety.

The preferred alternative is not the final decision on the project, but only the BLM's preference based on information presented in this EIS. A final decision regarding which alternative to adopt can not be made until 30 days after publication of the final EIS. The disposition of competitive grant parcels will be determined by modified-competitive bid following the final decision.

TABLE OF CONTENTS

	<u>Page Number</u>
<u>SUMMARY</u>	
INTRODUCTION.	S-1
PURPOSE AND NEED.	S-1
SCOPING	S-2
ALTERNATIVES INCLUDING PROPOSED ACTION.	S-2
MAJOR ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ALTERNATIVE ACTIONS	S-5
UNRESOLVED ISSUES AND AREAS OF CONTROVERSY.	S-9
IDENTIFICATION OF THE BUREAU OF LAND MANAGEMENT PREFERRED ALTERNATIVE	S-10
<u>CHAPTER ONE - INTRODUCTION</u>	
PURPOSE AND NEED.	1-1
SCOPING	1-4
MANAGEMENT GOALS AND OBJECTIVES	1-6
PERMITTING PROCEDURES	1-8
<u>CHAPTER TWO - ALTERNATIVES INCLUDING PROPOSED ACTION</u>	
INTRODUCTION.	2-1
ALTERNATIVE 1: APPLICANT PROPOSED ACTIONS.	2-1
Winofarms Ltd.	2-1
U.S. Windpower	2-11
Southern California Edison Company	2-19
PanAero Corporation.	2-34
San Geronio Farms	2-40
City of Riverside.	2-47
Smart and Company.	2-50
Natomas Energy Company	2-54
ALTERNATIVE 2: DEVELOPMENT ON LANDS EXCEPT THOSE WITH SIGNIFICANT SURFACE CONFLICTS	2-54
ALTERNATIVE 3: NO ACTION	2-55
AUTHORIZING ACTIONS	2-55
STANDARD OPERATING PROCEDURES	2-64
COMPARATIVE ANALYSIS OF ALTERNATIVES.	2-65

IDENTIFICATION OF THE BUREAU OF LAND MANAGEMENT PREFERRED ALTERNATIVE	2-65
--	------

CHAPTER THREE- AFFECTED ENVIRONMENT

INTRODUCTION.	3-1
ENVIRONMENTAL ELEMENTS.	3-1
Land Use	3-1
Visual Resources	3-2
Geotechnical Conditions.	3-6
Soils.	3-7
Hydrology.	3-8
Biological Resources	3-11
Vegetation	3-11
Wildlife	3-14
Noise.	3-22
Communications Interference.	3-22
Cultural Resources	3-23
Social and Economic Conditions	3-25

CHAPTER FOUR - ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND ALTERNATIVES

INTRODUCTION	4-1
ASSUMPTIONS AND ANALYSIS GUIDELINES	4-1
ALTERNATIVE 1	4-2
Land Use	4-2
Visual Resources	4-7
Geotechnical Considerations.	4-17
Hydrology.	4-19
Biological Resources	4-21
Noise.	4-36
Communications Interference.	4-43
Cultural Resources	4-49
Social and Economic Conditions	4-51
Mitigating Measures.	4-58
ALTERNATIVE 2	4-70
Land Use	4-70
Visual Resources	4-72
Biological Resources	4-76
Social and Economic Conditions	4-78
Unavoidable Adverse Impacts, Irreversible/Irretrievable Commitment of Resources, Short-Term Uses Verses Long-Term Productivity	4-83
ALTERNATIVE 3	4-84

<u>CHAPTER FIVE - CONSULTATION AND COORDINATION</u>	5-1
<u>LIST OF PREPARERS.</u>	3 pages
<u>GLOSSARY</u>	4 pages
<u>LITERATURE CITED</u>	5 pages
<u>APPENDICES</u>	
APPENDIX A: CONSTRUCTION SCHEDULES.	9 pages
APPENDIX B: WIND TURBINE SPECIFICATIONS	2 pages
APPENDIX C: PHOTOS SHOWING THE INSTALLATION OF MOD-2 AT GOODNOE HILLS, WASHINGTON.	10 pages
APPENDIX D: CONSTRUCTION PERSONNEL AND EQUIPMENT NEEDS	6 pages
APPENDIX E: ACCESS ROAD DESIGN AND SPECIFICATIONS . .	5 pages
APPENDIX F: TRANSMISSION LINE DESIGN.	8 pages
APPENDIX G: INSTALLATION OF U.S. WINDPOWER 56-50 AT LIVERMORE, CALIFORNIA	4 pages
APPENDIX H: VISUAL RESOURCE EVALUATION METHODOLOGY. .	3 pages
APPENDIX I: KNOWN AND POTENTIAL OCCURRENCES OF RARE, THREATENED, ENDANGERED PLANT SPECIES. .	2 pages
APPENDIX J: STANDARD OPERATING PROCEDURES	10 pages
APPENDIX K: FEDERAL REGISTER NOTICE "CALL FOR APPLICATIONS"	2 pages
APPENDIX L: MICROWAVE TRANSMITTERS.	7 pages
INDEX	3 pages

LIST OF TABLES

<u>Number</u>	<u>Title</u>	<u>Page</u>
2-1	Energy Production and Land Disturbance - Windfarms	2-7
2-2	Energy Production and Land Disturbance - U.S. Windpower	2-15
2-3	Energy Production and Land Disturbance - Southern California Edison	2-22
2-4	Energy Production and Land Disturbance - PanAero	2-36
2-5	Energy Production and Land Disturbance - San Geronio Farms	2-44
2-6	Energy Production and Land Disturbance - City of Riverside	2-49

2-7	Energy Production and Land Disturbance - Smart and Company	2-53
2-8	Alternative 2: Summary of Parcel Constraints	2-56
2-9	Alternative 2: Energy Production and Land Disturbance - windfarms	2-58
2-10	Alternative 2: Energy Production and Land Disturbance - U.S Windpower	2-59
2-11	Alternative 2: Energy Production and Land Disturbance - Southern California Edison	2-60
2-12	Alternative 2: Energy Production and Land Disturbance - PanAero	2-61
2-13	Alternative 2: Energy Production and Land Disturbance - San Geronio Farms	2-62
2-14	Alternative 2: Energy Production and Land Disturbance - City of Riverside	2-63
2-15	Comparison of Impacts	2-66
3-1	Geotechnical Categorization of Sites	3-6
3-2	Erosion Hazard and Flood Proneness	3-10
3-3	General Habitat Types	3-12
3-4	Rare, Threatened and Endangered Plant Species	3-15
3-5	Sensitive, Rare, Threatened and Endangered Animals	3-18
3-6	Population Centers within or Adjacent to the Study Area (1980)	3-26
3-7	Projected Population Growth	3-26
3-8	1980 Employment by Insured Covered - for Riverside-San Bernardino-Ontario SMSA by Sector	3-27
4-1	Significance of Potential Hazards in Categorized Areas	4-18
4-2	The Effects of Surface Disturbance from Actual Construction Activities on the Coachella Valley Fringe-Toed Lizard	4-28
4-3	Television Stations Received in Study Area	4-47
4-4	Television Interference Zone	4-48
4-5	Impact Mitigation Effectiveness	4-49
4-6	Estimated Property Tax Revenues by Parcel and Applicant	4-80

LIST OF FIGURES

<u>Number</u>	<u>Title</u>	<u>Page</u>
2-1	Boeing MOD-2	2-3
2-2	Hamilton-Standard	2-4
2-3	Site Layout - Windfarms	2-8
2-4	U.S. Windpower 56-50	2-13
2-5	Site Layout - U.S. Windpower	2-16
2-6	Bendix	2-25
2-7	WECS Tech	2-27
2-8	Westinghouse	2-30
2-9	Ventus	2-33

2-10	DAF INDAL	2-38
2-11	Site Layout - PanAero	2-41
2-12	J. Carter	2-45
2-13	Merkham	2-51
4-1	Viewpoint 4 - Upper Coachella Valley Looking West	Map Folder
4-2	Viewpoint 17 - Windy Point Looking North	Map Folder
4-3	Viewpoint 23 - Upper Coachella Valley Looking East	Map Folder
4-4	Viewpoint 24 - San Gorgonio Pass Looking East	Map Folder
4-5	Alternative 1 - Visual Simulation of Windfarms Proposal from Viewpoint 4	Map Folder
4-6	Alternative 1 - Visual Simulation of Windfarms Proposal from Viewpoint 17	Map Folder
4-7	Alternative 1 - Visual Simulation of U.S. Windpower Proposal from Viewpoint 4	Map Folder
4-8	Alternative 1 - Visual Simulation of U.S. Windpower Proposal from Viewpoint 17.	Map Folder
4-9	Alternative 1 - Visual Simulation of Southern California Edison Proposal from Viewpoint 4.	
4-10	Alternative 1 - Visual Simulation of Southern California Edison Proposal from Viewpoint 17	Map Folder
4-11	Alternative 1 - Visual Simulation of PanAero Proposal from Viewpoint 4	Map Folder
4-12	Alternative 1 - Visual Simulation of PanAero Proposal from Viewpoint 23	Map Folder
4-13	Alternative 1 - Visual Simulation of San Gorgonio Farms Proposal from Viewpoint 17	Map Folder
4-14	Alternative 1 - Visual Simulation of City of Riverside Proposal from Viewpoint 17	Map Folder
4-15	Alternative 1 - Visual Simulation of Smart & Company Proposal from Viewpoint 24	Map Folder
4-16	Operational Noise Prediction for MOD-2 WTC	4-39
4-17	Microwave Forbidden Zone	4-45
4-18	Television Interference Zone for Large Turbines	Map Folder
4-19	Television Inteference Zone for Medium Turbines	Map Folder
4-20	Alternative 2 - Prototypical Wind Farms Development from Viewpoint 4	Map Folder
4-21	Alternative 2 - Prototypical Wind Farms Development from Viewpoint 17	Map Folder
4-22	Alternative 2 - Prototypical Development from Viewpoint 23	Map Folder

LIST OF MAPS

<u>Number</u>	<u>Title</u>	<u>Page</u>
1-1	Location Map	1-2
2-1	Windfarms - Proposed WTG Sites, Roads and Transmission Line System	Map Folder
2-2	U.S. Windpower - Proposed WTG Sites, Roads, and Transmission Line System	Map Folder
2-3	Southern California Edison - Proposed WTG Sites, Roads, and Transmission Line System	Map Folder
2-4	PanAero - Proposed WTG Sites, Roads, and Transmission Line System	Map Folder
2-5	San Geronio Farms, City of Riverside and Smart & Company - Proposed WTG Sites, Roads and Transmission Line System	Map Folder
2-6	Alternative 2: Wind Development on All Lands Except those with Significant Surface Conflicts	Map Folder
3-1	Recreational Use Areas	Map Folder
3-2	Visual Units and Viewpoint Locations	Map Folder
3-3	Geotechnical Conditions	
3-4	Bird Data	Map Folder
3-5	Rare, Threatened, Endangered and Sensitive Plant and Animal Species	Map Folder
3-6	Microwave Transmitter Beams	Map Folder

CHAPTER 1

INTRODUCTION



CHAPTER ONE

INTRODUCTION

In accordance with the National Environmental Policy Act of 1969 (Public Law 91-190), the Bureau of Land Management (BLM) has prepared this document in response to the filing of rights-of-way applications by Windfarms Ltd, U.S. Windpower, Southern California Edison, PanAero Corporation, San Gorgonio Farms, the City of Riverside, Smart and Company and Natomas Energy Company for use of approximately 12,780 acres of public land. Seven of the applicants propose to use these public lands in southern California (Map 1-1) to develop large-scale wind energy farms.

This EIS is issued in association with the joint Environmental Impact Report/Environmental Impact Statement (EIR/EIS) prepared by BLM and the County of Riverside in March, 1982, which assesses the cumulative impact of wind energy development in the San Gorgonio Pass. The purpose of the cumulative assessment is to: (1) reduce delay and expense by eliminating duplication of federal and state environmental assessment requirements; (2) respond to public concerns; (3) facilitate cooperation among the BLM, county, state, federal and local agencies, utilities, and other interested parties in identifying the generic environmental, socioeconomic and technical opportunities and constraints related to the development of the wind generation resources in the San Gorgonio area; (4) use the EIR/EIS in the future to facilitate the preparation of environmental documents required by permitting authorities under CEQA and NEPA; and (5) provide for the orderly development of wind resources.

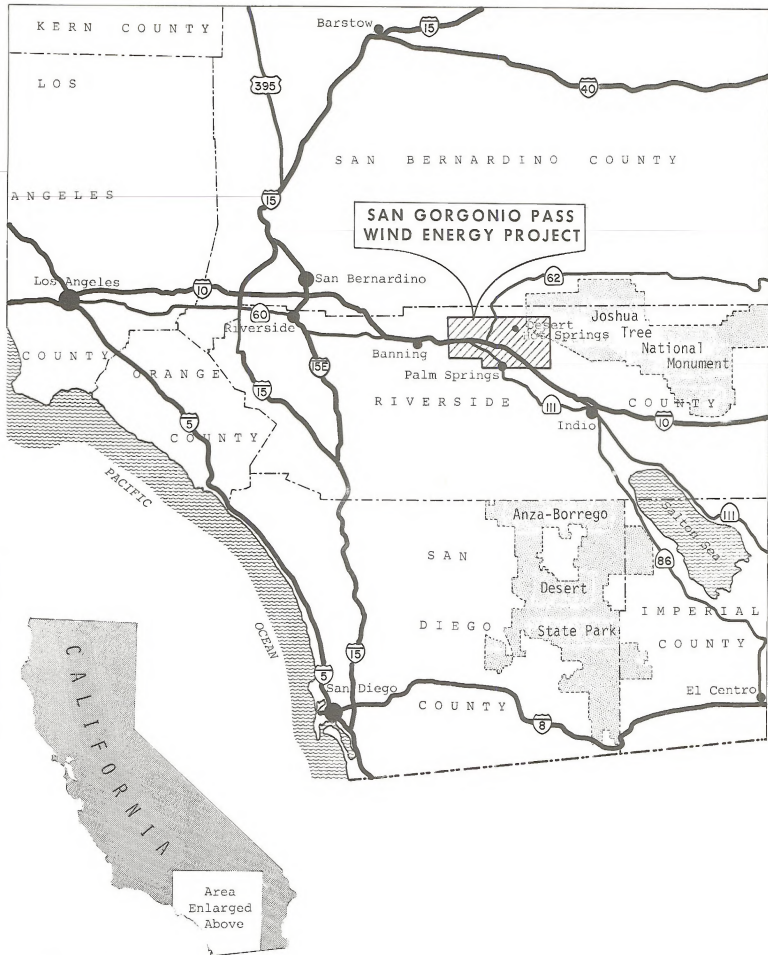
This chapter identifies the purpose and need for the project, the scoping process and identification of significant issues, the Bureau's management goals and objectives for wind energy development on public lands within the San Gorgonio Pass area and the Bureau's permitting procedures.

PURPOSE AND NEED

The purpose of the wind energy project evolves from a National and State need to develop alternative energy sources. Large-scale harvest of wind energy is feasible from a technical standpoint and the power source is nonpolluting and renewable. The proposed development of wind energy resources for electrical generation would serve the following purposes: help meet, in part, the need for increased power supplies in the early 1990's; reduce dependence on oil consumption for generating electricity consumed in the Southern California Edison (SCE) service territories; furnish access to the economy energy market; and enhance system flexibility.

MEET THE FORECASTED NEED FOR POWER

In its 1981 report, Electricity Tomorrow, the California Energy Commission (CEC) estimates that by the year 2000, an additional 2,000 megawatts (MW) will be required to meet SCE's steadily increasing demands. To help meet this forecasted increase, Southern California Edison has proposed using wind energy to supply 560 MW of installed capacity by 1992, roughly 25 percent of the projected additional increase. Southern California Edison plans to reach this capacity through power purchase agreements with



MAP 1-1
Location Map

private developers. The proposed wind energy project in the San Geronio Pass would provide SCE with a significant portion of this capacity.

REDUCE THE DEPENDENCY ON OIL & GAS CONSUMPTION FOR GENERATING ELECTRICITY

The 1973-74 Middle East oil embargo sharply focused State and national attention on the nation's energy supply and the inherent vulnerability caused by the increasing dependency on foreign supplies. This situation resulted in nationwide efforts to reduce reliance through development of domestic fossil and non-fossil fuel energy sources. California was especially hard pressed because about 59% of the State's energy came from gas and oil.

From the extensive analysis of options that followed the embargo, wind energy emerged as a bright prospect. In 1979, the CEC concluded that, "Of all of the alternative solutions proposed for resolving the energy dilemma, wind energy systems are one of the most attractive."^{1/} The development of California's renewable energy sources such as wind, solar, small hydro, and biomass, as well as geothermal and efficient cogeneration remain one of the State's highest priorities. Focusing public and private capital towards investments in these options and distributing their benefits widely and fairly among California's citizens is the State's overriding policy objective for the electricity sector.

Southern California Edison's ten year resource plan calls for generation of 2,100 MW of power from renewable resources by 1990. Electrical power generated from wind would contribute almost 7 percent of these needs and provide 1,226 million kilowatt hours on an annual basis - enough energy to supply nearly 200,000 households with electricity for one year. In terms of annual oil savings, this would displace the equivalent of two million barrels of oil. With the first turbines coming on line in 1983, wind energy could provide an almost immediate contribution to the grid system.

FURNISH ACCESS TO THE ECONOMY ENERGY MARKET

Development of the San Geronio wind resource would provide SCE access to lower-cost, non-oil fired power to displace energy currently generated in the Los Angeles area. Potential savings, based on California Energy Commission estimates, could range from \$11,000 to \$58,000 per million kWh^{2/} or an average of \$43,000,000 per year by 1990.

ENHANCE SYSTEM FLEXIBILITY

The intergration of a wind energy source into the utility system would permit capacity and energy exchanges between SCE and other utilities during emergency situations, thus improving the efficiency and economics

^{1/} California Energy Commission, Impact of Large Wind Energy Systems in California, September 1979, p. 1-6.

^{2/} CEC, Electricity Tomorrow, 1981 Final Report, p. xxvi.

of the total system. Primary fuel sources (oil and gas) would be diversified so that impacts resulting from the interruption of any one type of fuel supply would be minimized.

SCOPING

In accordance with the National Environmental Policy Act of 1969 (NEPA) and the implementing regulations of the Council on Environmental Quality (Federal Register, Vol. 43, No. 230), a notice announcing a series of scoping meetings was published in the Federal Register on March 11, 1981. Two EIS scoping meetings were held in cooperation with Riverside County in April, 1981, in Palm Springs and Banning, California. The purpose of the meetings was to determine significant issues related to wind development in the San Geronio Pass and provide guidance in determining the scope and level of detail for the regional and site-specific EISs.

Information collected during these meetings resulted in the identification of the following issues:

AESTHETICS

Wind turbines will be highly visible because of their height. The overall design as well as the tower design varies substantially among machines. Apparently some people have clear preferences for certain designs and some people generally like or dislike all machines. A wind turbine must be viewed in relation to its natural and manmade environment (including other wind turbines) in order to assess its visual impact.

SAFETY

The most discussed safety issue has been the potential for a blade to separate itself from the wind turbine and cause injury at some distance from the machine. Such failures have occurred but are uncommon, especially as more engineering experience is gained. Tower collapse has been raised as an issue but also is very uncommon. People, especially children, could climb on the tower and be injured; this problem has been addressed in other types of structures. Aircraft could conceivably hit the wind turbines and machines must comply with applicable Federal Aviation Administration criteria to reduce this hazard. Electrical safety with regard to fire and the interconnection with a utility line are issues that have been addressed and have available engineering solutions.

NOISE

Wind turbines may make some noise, either from the movement of their mechanical parts or from the interaction of the wind with the machine. Usually this noise is not loud and many people do not find it objectionable. Several exceptions exist, notably the MOD-1 machine installed near Boone, North Carolina. Research is continuing on the noise issue. Downwind machines appear to be more susceptible to noise problems than other designs. Each machine design must be tested for noise because generalizations from one machine to another are not possible at this time.

ELECTROMAGNETIC INTERFERENCE

The blades of a wind turbine have been known to cause interference with television reception. This impact is less with directional than omnidirectional receiving antennas. The blade material and size, strength of the signal, and distance from the transmitting antenna to the wind turbine also affect the amount of interference. Rotor blades have the potential of interfering with microwave communications if the blades are close enough to the direct line-of-site path of the signal. Wind turbines, if not properly sited, also have the potential of affecting ground-based aircraft navigational systems.

ECOLOGY

Bird collision with the wind turbines has been raised as a possibility. Birds often collide with transmitting towers; in some areas of the country this has been a major concern. However, experience to date has not indicated any significant bird collision problems with existing wind turbines. The construction of the wind turbines and their associated roads, fences, control buildings, and electrical distribution and transmission lines can disturb vegetation and animal life. The effects on the immediate ecology from the operation of the wind turbines require further study.

LAND USE

Many of the land use issues have been dealt with indirectly in the above paragraphs. Others include land area requirements, compatible uses, and compliance with local land-use regulations. Total land area requirements vary because no consensus exists on the optimum spacing of the machines. But the actual amount of land used is small compared with the total area of the wind turbine array. Land not used for the base of wind turbines and for roads may be put to other uses such as agriculture. Wind turbines, unless exempted, have to comply with height and setback restrictions. A related issue is the type of process which the permit approving authority uses to evaluate and approve applications.

WIND ACCESS AND EQUITY

A wind turbine needs a supply of wind in order to operate. The velocity, direction, and time (frequency and duration) of the wind should be calculated into a site selection approach by the potential wind turbine owner. Potential obstructions such as buildings, vegetation, and other wind turbines can affect the supply of wind to a wind turbine in two ways: the velocity can be changed or turbulence can be increased. A decrease in velocity means reduced energy output and an increase in turbulence may reduce the energy output and, perhaps more critically, reduce the useful life of the wind turbine. Buildings and vegetation are more of a problem with small machines and with machines in urban areas; the only manmade structure in rural areas likely to affect large wind turbines is another wind turbine. One approach to wind access is for the wind turbine owners to purchase or lease an interest in land which would ensure an adequate wind supply. This approach does not always work, especially if the owner or owners of surrounding land may also want to install wind turbines.

These issues, a discussion of planning and regulatory issues, and the general environmental impacts that would occur with wind energy development in the San Geronio Pass are addressed in the generic EIR/EIS prepared by BLM and the County of Riverside - the San Geronio Wind Resource Study, Draft Environmental Impact Report/Environmental Impact Statement. In the site-specific analysis of wind development on the public lands which follows, detailed information contained in the joint EIR/EIS is either referenced or, in some instances, summarized in accordance with the concept of "tiering" and "incorporation by reference" contained in the 1978 CEQ regulations. (Chapter 5 contains a list of libraries in the study area where public reading copies are available for review). In addition, certain specific actions associated with complete development of the applicants' proposals (i.e., flood control structures, grading plans, etc.) are not addressed as they will be subject to more detailed evaluation as onsite engineering takes place for the alternative finally selected for implementation.

For the purposes of this EIS, the analysis focuses primarily on significant impacts associated with aesthetic values, threatened and endangered species (Coachella Fringe-toed Lizard), bird migration, socioeconomic changes, noise, and electromagnetic interference (television, radio and microwave). Discussions are also provided concerning land use changes (recreation plans and the Pacific Crest Trail (PCT)), wilderness, soils, and cultural resources.

Environmental elements not identified as being of major public concern or considered significant by the technical specialists preparing this document include: climate, fugitive dust, topography, geology, and commonly occurring species of vegetation and wildlife. A discussion of these elements and the degree to which they may be impacted can be found in the generic EIR/EIS.

The impact analysis focuses primarily on the proposed development of wind energy conversion systems, access roads, and transmission line systems.

The County of Riverside is presently preparing an Environmental Impact Report (EIR) in response to wind energy applications requesting approval to develop private lands in the study area. Several of these applications abut public land and would impact both the type and degree of development permitted on adjoining public land. The County's EIR will be published in April 1982 in conjunction with this EIS.

MANAGEMENT GOALS AND OBJECTIVES

GENERAL POLICY

In 1980, the Bureau of Land Management completed a long-range, comprehensive plan for the California Desert Conservation Area. This plan provides general direction for managing competing resource demands on public lands based on the principles of multiple use, sustained yield, and maintenance of environmental quality.

The general goal of the energy resources element within the CDCA is to provide access to and availability of as much public land as possible for energy exploration and production. This goal is consistent with national energy policy which encourages private enterprise to develop our nation's

energy resources to meet current and future energy needs, with particular emphasis on reducing the need for importing foreign oil. To meet this demand, the nation must use many available sources of energy--coal, gas, oil, wind, solar, hydroelectric, and nuclear--and no one source is an exclusive alternative to any or all of the other sources. In this context, wind energy would be a feasible means of supplementing other forms of electric power generation.

The issuance of a right-of-way for wind development may result in a long-term commitment on the part of the Bureau to permit wind energy production on public lands under continuing regulation and environmental control. This would be accomplished under the principles and procedures of 43 CFR Part 2800 pursuant to the Federal Land Policy and Management Act of 1976. This policy provides for (1) orderly and timely resource development, (2) protection of the environment, and (3) receipt of fair market value for disposition of the public resources.

Orderly and timely development includes the responsibility to foster, promote, and encourage the exploration for and the production of energy resources from the public lands; encourage the active development of energy resources in a manner compatible with the use of the same lands for other purposes; assure that energy developers receive the acreage necessary for economic investment, development, and production; encourage the maximum recovery of the wind resource; and assure adequate minimum production and diligent development requirements for wind resources.

Protection of the environment would include the responsibility to assure that wind exploration and development be conducted with protection of the environment; assure the rehabilitation of disturbed lands; assure that precautions are taken to protect public health and safety; and assure full compliance with the spirit and objectives of the National Environmental Policy Act of 1969, other federal environmental legislation, and supporting Executive Orders and regulations (described below).

Receipt of fair market value would include the responsibility to assure the public a fair market value return for the use of public lands and the use of its wind resources.

SPECIFIC GOALS AND MANAGEMENT DIRECTION

The following goals have been derived from State and federal laws and regulations, management concerns, and public issues. These goals provide direction for managing natural resources on public lands within the San Geronio Pass area. These goals will serve as part of the criteria used to evaluate and compare alternatives for wind development in the site-specific EIS.

1. Maintain visual resource values through the application of landscape management standards based on the BLM's Visual Resource Management System (VRM).
2. Protect cultural and natural resources within the Whitewater Canyon and Big Morongo Canyon Areas of Critical Environmental Concern (ACEC).
3. Meet the Geology-Energy-Minerals (GEM) objective in the California Desert Plan by providing access and availability to public lands for wind energy development.

4. Conserve federal and state listed rare, threatened, or endangered plants and animals.
5. Identify, evaluate, and, where appropriate, protect Native American, historical, and archaeological values.
6. Protect unstable soils and slopes over 25 percent (where visual impacts might not be mitigated and high risk of soil disturbance may not be stabilized) in compliance with Riverside County hillside development standards.
7. Comply with state and federal air quality standards.

PERMITTING PROCEDURES

The San Geronio Pass area has, for some time, been recognized as having a high potential for wind-generated electrical power. Elevation, year-round access, and location near energy markets have generated extreme interest for wind development within the study area by a number of applicants; many now vying for the same parcel(s) of public land.

Because of "overlapping" applications received by BLM, and continued site-inquiries, the Bureau issued a 60-day "call for applications" for public lands in the San Geronio Pass area, on August 26, 1981 (Federal Register, Vol. 46, No. 165). The Federal Register notice outlined the procedures for applying for public lands in the San Geronio Pass and the conditions under which applications would be accepted (see Appendix K). A total of nine applications were received. Of these, eight were found to be in compliance with the call.

The Bureau's permitting procedures for awarding right-of-way grants were released for public review in the February 25, 1982 Federal Register (Vol. 47, No. 38). These procedures, designed to work within the Bureau's land use planning and programming system, are also designed to meet the Bureau's objectives for wind energy development in the San Geronio Pass area as outlined in the preceding section.

The first overriding objective requires that the BLM permitting procedures provide for orderly and timely resource development. The BLM's planning and environmental analysis process provide for the orderly development of wind energy resources on public lands through a comprehensive analysis of significant resources, their relative values, and the associated environmental considerations. The procedures meet the requirement of timeliness in its early identification of high wind energy development sites, where industry interest is high, public concern is low and where the Bureau's land use plans have indicated the area's suitability for development.

The second Bureau objective is stressed throughout the permitting process, beginning with a comprehensive analysis of all resource values. Subsequent stages of the process involve minimizing or mitigating the impacts of development by eliminating or constraining development in areas which have overriding resource values (e.g., wildlife habitats) or any physiographic constraints - slopes, for example. Public meetings throughout the process offer avenues of communication and critical review by all interested parties. Even though areas may have been identified in previous

planning efforts as being tentatively suitable for leasing and development, the Bureau further ensures protection of these areas by designing rehabilitation standards, compliance guidelines, permitting stipulations on development and bonding requirements.

The Bureau's third overriding objective, to assure fair market value return for resources sold, will be accomplished through the establishment of rentals, royalties, and competitive bonus bids. The addition of royalties returns to the government a fair share of the value of the resource. Bonus bids reflect the accessibility and value of the resource, provide an avenue for the expression of competitive interest, and adjust the total prior determination of rental and royalty to fit the fair market value at that point in time.

Right-of-way grants on public lands are authorized under the authority of Title V of the Federal Land Policy and Management Act of 1976. The Secretary of the Interior is granted the authority to promulgate rules and regulations necessary to carry out the provisions of the Act. The regulations pertaining to the granting of the rights-of-way on public land are contained in Title 43 of the Code of Federal Regulations (CFR), Part 2800.

Under these regulations, the Secretary of the Interior is authorized to grant or permit "the use of a right-of-way over, upon, under, or through public lands for (the) construction, operation, maintenance, and termination of a project ... either linear or areal in character ... (for) systems for generation transmission and distribution of electrical energy" (Parts 2800.0-5 and 2800.0-7).

The Bureau's permitting process consist of two stages: an environmental analysis and a modified-competitive bid. The environmental analysis process is used to evaluate each application, and on the basis of this analysis, determine the type and degree of development which would be permitted on public land. In those instances where overlapping applications exist and the EIS determines that development could occur, selection will be by modified-competitive bid. Only those applicants who had previously submitted applications during the 60-day "call for applications" will be allowed to submit bids. Bids will only be accepted for those areas applied for in the original application subject to development restrictions identified by BLM in the Record of Decision. Offerings are made through sealed bids and awards will be based on the highest cash bonus.

The grant issued under Part 2800 is for a term of 30 years, and as long thereafter as the grantee complies with the terms of the grant. At the end of 20-years, the Secretary may readjust the terms (2801.1-1 (1)).

Each ROW grant is conditioned upon payment of specified royalties and rentals to the United States. The amount of these royalties will be fixed by the Secretary in advance of offering the grant. Each grant must also provide for payment of an annual rental, payable at the beginning of each year. Each grant must contain provisions to protect the interest of the United States, to safeguard the public welfare, and to insure exercise of care and diligence in the operation of the right-of-way and also certain provisions relating to health and safety (43 CFR Part 2801.2). Failure to comply with the terms of the grant is a basis for termination.

Of the monies received by the Federal Government from grant bonuses, rentals, and royalties, fifty percent is paid to the State in which the lands are located.

A bond conditioned upon compliance with all conditions of the lease, must be furnished on all grants issued (43 CFR Part 2803.1-3).

CHAPTER 2

ALTERNATIVES

CHAPTER 2

ALTERNATIVES INCLUDING THE PROPOSED ACTION

INTRODUCTION

Eight applications representing twelve wind development proposals are described in detail in this chapter. Also included are two alternatives which would, in varying degrees, constrain development in environmentally sensitive areas. The no action alternative, which would exclude wind development on public lands, is included as a basis for comparison with the other alternatives. A discussion of authorizing actions, standard operating procedures and mitigating measures required to receive approval to utilize public lands, a comparative summary of the impacts of the applicant's proposals and the two alternatives, and the Bureau of Land Management's preferred alternative are also included.

ALTERNATIVE 1: APPLICANT PROPOSED ACTIONS

WINDFARMS

Windfarms, Ltd. of San Francisco proposes to construct a total of sixty-one 2.5 and/or 4.0 megawatt (MW) wind turbine generators (WTG) on 8,332 acres of public land and 845 acres of private land in the San Geronio Pass (Map 2-1). Development would occur in four phases with construction of the first phase (seven machines) scheduled to begin in 1983 concluding a year and a half later. Construction of the remaining forty-five WTGs would begin in 1984 with completion of all facilities by the end of 1988 (see Construction Schedule, Appendix A).

The proposed wind farm would include turbine installations, several transmission lines to collect power and interconnect into the local power network, the installation of a new substation and construction of access roads to support system requirements. An annual output of 631 million kilowatt hours is expected by 1989.

Wind Turbine Generators

Two types of wind turbine generators (WTG) are being considered for the Windfarm's project. These are the Boeing MOD-2, rated at 2.5 MW, and the Hamilton Standard WTS-4, rated at 4.0 MW. Criteria for machine selection by the applicant would include performance, availability, cost and financing, and guarantees from the manufacturers.

Boeing MOD-2

Design Characteristics: The MOD-2 is a two-bladed, upwind, turbine generator with a 300-foot rotor mounted on a 193-foot tall, 10-foot thick cylindrical steel shell-type tower rigidly attached to a concrete spread footing foundation. The total height of the WTG structure would be 350 feet with the blade in a vertical position. Each turbine would produce 2,500 kilowatts of power at its rated wind speed of 28 mph.

The 300-foot blade is designed to rotate at a constant speed of 17.5 rpm. During periods of low wind (under 15 mph) or wind which exceeds the designed blade operation load (over 60 mph), the blades are feathered. In a feathered position, the blades are designed to withstand wind velocities of 125 mph. The blade is attached to a drive-train which includes a generator and which is enclosed within a fiberglass nacelle, which rotates on top of the tower in response to wind direction.

A picture of the WTG is shown in Figure 2-1 and turbine specifications are provided in Appendix B.

Control Functions: Hydraulic yaw drive, blade tip pitch, and braking systems are automatically controlled by the control system micro-processor during startup, operation, and shutdown. All vital control functions are failsafe designed to ensure safe shutdown in event of system failure or loss of power.

Generator voltage and phasing is controlled automatically by generator accessory circuits during startup and by the power grid during operation. Over-current protection is provided for the generator output circuit by circuit breakers.

Safety Features: The electrical systems of the Boeing MOD-2 have been designed to comply with the National Electrical Safety Code (NESC), 1978 Edition. Lightning protection on all circuits is provided by the grounded steel structure. The system will provide for constant monitoring of blade condition to prevent structural failure. No estimate of blade throw potential is available.

Hamilton Standard WTS-4

Design Characteristics: The Hamilton Standard WTS-4 is a two-bladed, downwind, synchronous WTG with a 256-foot rotor mounted on a 245 foot tall, 13-foot thick cylindrical steel tower. The total height of the WTG structure would be 391 feet with the blade in a vertical position. Each turbine would produce 4,000 kilowatts of power at its rated wind speed of 36 mph.

The rotor is fitted to a hub assembly, which houses the hydraulic mechanism which automatically increases or decreases blade exposure to maintain a constant speed of 30 rpm. At wind speeds of 60 mph or more the blades would be feathered and braked. In a feathered position, the blades are designed to withstand wind velocities of 150 mph.

The blade is attached to a drive train assembly, which is attached to the top of the tower through a 10-foot diameter yaw bearing. The yaw design allows the nacelle to rotate freely in response to wind direction.

A picture of the WTG is shown in Figure 2-2 and turbine specifications are provided in Appendix B.

Control Functions: Control systems in the nacelle include the hydraulic system that drives the pitch control mechanism, a rotor brake, generator excitor controls, and the micro-processor control unit that permits unattended operation of the turbine generator and performance monitoring. An emergency feather logic, located in the nacelle, provides the backup

FIGURE 2-1 Boeing MOD-2



FIGURE 2-2 Hamilton-Standard WTS-4



logic which safely shuts down the system in the event of a normal control malfunction. A dual hydraulic system would feather the blades even without electrical power.

The generator voltage and phasing is controlled automatically by the power grid during operation.

Overcurrent protection is provided for the generator output circuit and all accessory power circuits by protective relays, fuses, and/or circuit breakers.

Safety Features: As with the MOD-2, the electrical system for the Hamilton Standard turbine have been designed to comply with National Electrical Safety Codes.

The manufacturer estimates the probability of blade throw so low as to be uncalculatable.

Control, Shop, and Warehouse Facility

A control building, shop and warehouse facility would be located adjacent to the proposed substation on private land. Access would be by an existing road.

The control building would cover an area of approximately 4,300 square feet and be fully self-contained. It would provide central monitoring of WTGs, the capability to start-up, shut-down each WTG, and serve as a space for instrument repair and offices.

The shop and warehouse facility would cover an area of 7,250 square feet. Maintenance and minor instrument fabrication would take place in the shop and the warehouse would be used to store chemicals, parts, and heavy equipment.

Security of Facilities and Equipment

Each WTG and all power conditioning equipment would have outdoor lighting and security fencing. Each WTG tower door would have a lock, intrusion alarm, and automatic shutdown. Towers would not have exterior ladders or handholds. Maintenance and/or security personnel would be at the project location at all times.

Pre-Construction Activities

Land surveys and soil testing would be conducted prior to constructing the WTG facilities. The topographical surveys would provide information on the extent of clearing, grading, and surface drainage necessary for site preparation. Soil testing would involve the excavation of approximately 30 feet of material at each site as well as drill borings to determine depth to bedrock. Together this information would be used to evaluate surface and subsurface conditions related to WTG foundation design.

Construction Activities

Construction methods would generally be the same for both the WTS-4 and MOD-2. Construction would proceed in the sequential steps as described below. Table 2-1 gives a summary of temporary and permanently occupied

land areas. Appendix C shows the installation of three MOD-2s at Goodhoe Hills, Washington, site of the first large wind farm.

Site Preparation

The site would be cleared to allow preparation of the area for the wind turbine generator and WTG erection equipment. Preparation of the site would require the excavation, backfilling, grading, and compaction of material to create a level area approximately 150 feet wide and 350 feet long (see Figure 2-3).

Based on data derived by Windfarms for their project in Solano County near Fairfield, California, it is estimated that 10,000 to 20,000 cubic yards of earth would need to be moved to prepare a typical WTG site. On flat to gently rolling terrain where slopes do not exceed 3 percent, such as in the Whiterwater flood plain, excavation would be less than half this amount. The actual amount of excavation for an individual site would be determined by the existing slope, the need for additional fill material, and foundation excavation.

Transportation of WTG and Construction Equipment from Storage Area to Site

Equipment would be transported to each site by a trailer capable of supporting a 200 ton load.

Wind Turbine Generator Installation

Install Foundations and Underground Conduit:

Erect First Tower Section:

Install Ground-Mounted Electrical Equipment:

Install Nacelle-Tower Adapter and Nacelle and Hub/Pitch Change

Mechanism on Test Pad:

Interconnect Nacelle Assembly to Electrical Equipment:

Conduct Ground Level Checkout:

Install Blades:

Complete Tower Erection:

Erect Nacelle/Rotor Assembly:

Install Tower Internals:

Conduct Checkout Tests:

The construction sequence can be varied depending primarily on site conditions and the technique selected for erecting the tower and nacelle/rotor assembly. For example, the tower could be ground assembled, internals installed, and erected as one assembly.

On completion of construction, storage and construction areas would be cleaned and restored as near as possible to their original conditions. All rubbish and waste materials would be hauled away and disposed of at approved sites.

Temporary Use Areas: Temporary laydown facilities approximately 10 to 15 acres in size would be constructed on both public and private lands. These facilities, such as prefabricated structures and trailers, would be used as warehouses, tool shops, offices and first aid stations.

TABLE 2-1

ENERGY PRODUCTION AND LAND DISTURBANCE ^{1/}

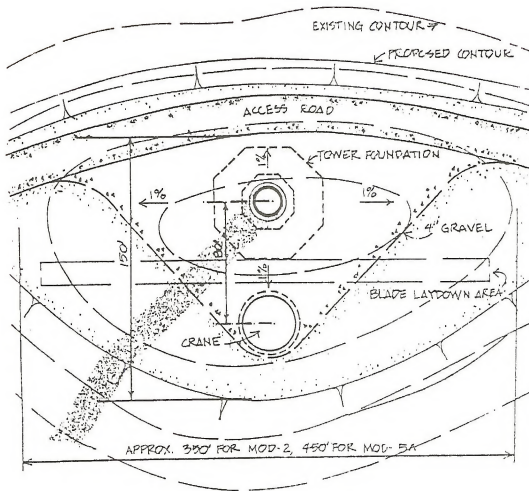
WINDFARMS

	Phase I	Phase II	Phase III	Phase IV	Total
Number of Turbines	7 (9)	13 (2)	10	20	50 (11)
Type of Turbines	---MOD-2/WTS-4---				
Power Generation (Million kWh)	117.6	160.5	107.0	186.0	631.0
Wind Turbine Generators					
Temporary Disturbance Construction Site (acres)	8.4	15.6	12.0	24.0	60.0
Maintenance Yards (acres)		0.0	0.0	12.5	12.5
Permanent Disturbance Tower Base (acres)	2.3	3.3	2.5	5.0	13.1
Transformer Pad (acres)	0.3	0.5	0.3	0.7	1.8
Maintenance and Control Building (acres) ^{2/}	0.0	0.0	0.0	0.0	0.0
Roads					
New Road (miles)	2.2 (1.5)	2.9 (0.4)	2.6 (0.1)	3.3(0.4)	11.0 (2.4)
(acres)	8.0	10.4	9.3	11.9	39.6
Upgraded Roads (miles)	0.4 (1.8)	2.1 (0.5)	1.4 (1.8)	0.9(2.3)	4.8 (6.4)
(acres)	1.5	7.6	5.1	3.3	17.5
Transmission Line System					
33 kV Overhead Lines (miles)	0.0	0.0	1.1	0.0	1.1
Temp Disturbance (acres)	0.0	0.0	0.1	0.0	0.1
Perm Disturbance (acres)	0.0	0.0	0.0	0.0	0.0
Underground Lines (miles)	1.1	2.7	2.6 (0.3)	4.1(3.8)	10.5 (4.1)
Temporary Disturbance (acres) (when not following road)	0.1	0.5	.1	0.0	0.7
Permanent Disturbance (acres)	0.0	0.0	0.0	0.0	0.0
Substations (acres)	0.0	0.0	0.0	0.0	0.0
Total Temporary Disturbance (acres)	10.9	15.6	12.1	36.5	75.1
Total Permanent Disturbance (acres)	12.1	21.8	17.2	20.9	72.0

^{1/} Figures in parentheses are for private lands. All other acreage and mileage figures are for public lands.

^{2/} Maintenance and control buildings would be located on private lands.

FIGURE 2-3
Site Layout - Windfarms



WINDFARMS
TYPICAL SITE GRADING

Construction Personnel and Equipment

Construction of the proposed wind farm would require a limited work force composed of both technical and common laborers. Most of the members would be drawn from the local labor force. The maximum number of construction personnel on the project at any time would be approximately 40.

The number of workers and types of equipment required to complete the proposed system are shown in Appendix D.

Source of Construction Material

It is anticipated that sands, gravels, and aggregates would be hauled from the Whitewater Canyon area, a distance of approximately 1 to 11 miles, depending on the site.

Earthfill borrow materials would be available from within the 30 foot right-of-way required for construction of site roads. Topsoil and waste from excavation not used in road section construction would be spread evenly over the ground within the site road right-of-way or on adjacent land areas and low land depressions within the 1.2 acre wind turbine construction sites.

Cement would be hauled from one of the existing plants located in the Ontario or Palm Springs areas.

Operation and Maintenance

The wind turbines have been designed for automatic unattended operation with a manual control override. Output data would be monitored on site from the control building. Once construction is completed a staff of approximately 20 would be required to operate and maintain the wind farm.

Wind turbine facilities would be inspected regularly by a full time maintenance crew of at least four technicians. The basic WTS preventative maintenance period is for one year, with some areas requiring minimal maintenance for up to ten years. Each machine is predicted to require approximately 300 manhours of scheduled and unscheduled maintenance per year. Routine maintenance consists of such things as lubrication, painting, and mechanical inspections.

Access Roads

An estimated 11.0 miles of new construction would be required to provide access to WTG sites. Two miles of existing private roads and 11.9 miles of public roads would need to be improved. Roads would be graded and surfaced with gravel. Design criteria and an illustration showing the cross section of a typical access road is provided in Appendix E.

Transmission Line System

Electricity from the wind turbine generators would be transmitted through 34.5 kV lines which, in most cases, would run underground along the shoulder of access roads. In one area the terrain would not permit cable burial and there, overhead transmission lines would be required. To limit excavation requirements a helicopter would be used to transport equipment and workers.

Underground Transmission

Approximately 19 miles of underground transmission would be required to interconnect the 61 WTGs to the proposed new substation located on private land (Section 1, T.3S., R.3E., S8M) northwest of Whitewater Hill and Southern California Edison's existing substation at Garnet. Except for 3.1 miles, the lines would be confined within an 18 to 28 foot ROW. Specifications of the transmission lines are given in Appendix F.

The WTGs would generate electrical power at 4.16 kV. At the base of each WTG would be a step-up transformer which would increase the 4.16 kV of the WTG to an intermediate power collection voltage of 34.5 kV.

The step-up transformer would be located on a foundation located immediately adjacent to the WTG site. The transformer and protective switchgear would occupy an area of approximately 400 square feet and be enclosed by a security fence.

Methods used in the construction of the transmission line facilities would be similar for all sites. A 6-inch diameter 34.5 kV line, together with a 2 inch diameter control cable, would be buried in a common right-of-way leading from the transformer to the main access road. From that point the cables would be placed in a standard dimension ditch, 12 inches wide, centered on a line about 3 feet from the edge of the road bed. The ditch would be excavated mechanically with a ditching machine. The trench would not normally be open more than 1 to 2 days at a time.

The depth of the ditch would vary with the conditions encountered. The cover from the top of the cable to ground level would generally be 3 feet thick. These depths are in conformance with normal utility practice. Occasionally the ditch would be excavated to depths greater than the stated minimums. For instance, if the transmission line were to traverse an area for which there were plans to level the land for other purposes, the cable would be buried at the level necessary. When crossing canals, aqueducts or road crossings, the depth of the ditch would conform to appropriate regulations.

In areas where loose or unconsolidated rock is encountered, the ditch line may be ripped mechanically. This process might involve a tractor dragging a long shank (ripper-tooth) behind it to dislodge the material. If the material encountered cannot be ripped, it would be blasted. Blasting would be used as little as possible and only when necessary. Where blasting is necessary, safety precautions would be taken as described in Appendix J.

Backfilling would fill the space below and beside the cables with loose materials. In rocky areas, the bottom of the ditch would be padded with fine materials (sand or soil) to provide a uniform bearing surface. This material would be provided on site. Backfill material that could not be placed back in the ditch would be used as road fill. Once the road bed and drainage ditches were completed, the ROW and any other areas affected would be cleaned of trash, brush and other debris to prevent fire hazards. In addition, all disturbed surfaces would be restored to approximately the preconstruction grade.

Overhead Transmission Lines

Approximately 1.1 miles of overhead transmission line would be required to interconnect wind turbine generators during Phase III of the project. The line would traverse the east slope of Whitewater Canyon.

Design: Tubular steel tangent poles would be used for the proposed 34.5 kV and 115 kV overhead transmission line. Design characteristics of the transmission line and towers are included in Appendix F.

Construction: The construction, maintenance, and operation of all overhead electrical supply lines in the state of California are governed by "Rules for Overhead Electric Line Construction" General Order 95, issued by the California Public Utilities Commission.

Transmission line construction would follow a sequence of right-of-way clearing; tower foundation construction; hauling, assembly, and erection of poles; conductor and shield wire stringing and site restoration.

Table 2-1 contains the approximate land areas that would be required by the proposed transmission line right-of-way.

Operation and Maintenance: Ground inspection of the proposed power line would be done every 6 to 12 months. Because of the limited length of the line, surveillance would probably be done on foot.

Substations

Windfarm's proposes to build one new substation to handle the combined output of the first three phases (approximately 164 MW). The substation would contain several breakers, separation switches, and step-up transformers to convert power from 34.5 kV to 115 kV. From here, power would be transmitted to Devers over an existing ROW. Phase IV of the project would tie into SCE's substation at Garnet.

The new substation would occupy an area of approximately 100 x 185 feet including a small parking lot. After installation of all equipment, the complex would be enclosed by an eight-foot high fence with a gate.

U.S. WINDPOWER

U.S. Windpower of Burlington, Massachusetts proposes to develop a windfarm of 2,750 fifty kilowatt (kW) wind turbines on 3,600 acres of public land (Map 2-2). Development would occur in three phases:

- (1) Whitewater Canyon area: 900 machines generating 45 megawatts of power located on approximately 1,200 acres
- (2) Whitewater Hill-Windy Point area: 350 windmills generating 17.5 megawatts of power on approximately 500 acres
- (3) Whitewater River area: 1,500 turbines generating 75 megawatts of power on 1,900 acres

Construction of the first phase would be completed in 1984, completion of the second phase in 1985, and completion of the third phase in 1987 (see Construction Schedule, Appendix A).

The wind turbines would be sited in parallel lines running perpendicular to the direction of the prevailing winds. The distance between windmills in the line (crosswind of each other) would be 85 feet. The distance between the lines of windmills down-wind from each other would be about 500 feet (Figure 2-5). The applicant has stated that this spacing would be required to allow the wind to recover its velocity between rows. Approximately 150,000 kilowatt hours would be generated on an annual basis.

In addition to the turbines, construction of the wind field would include several maintenance buildings, access roads, transmission lines, and switchyards.

Wind Turbine Generator

The windmill proposed for use is U.S. Windpower's Model 56-50, which is manufactured by the applicant. This machine is presently operating on two windfarms located in New Hampshire and California. One hundred machines are currently being installed at Altamont Pass near Livermore, California as the first phase of a project which will generate 30 MW of power.

U.S. Windpower 56-50

Design Characteristics: The U.S. Windpower (USW) 56-50 is a three-bladed, downwind, induction WTG with a 56-foot rotor mounted on a 60 to 100 foot tall, 4 inch steel-pipe tripod tower attached to a concrete friction pier footing foundation. The total height of the windmill structure would be 90 to 130 feet with the blade in a vertical position. Each turbine would produce 50 kilowatts of power at its rated wind speed of 22 mph.

The rotor assembly includes three fiberglass taperec blades, each 28 feet long. The blades are affixed to a cast aluminum hub designed to rotate at a constant speed of 72 rpm. Blade pitch is controlled by an electric motor, which increases or decreases blade exposure to maintain constant rpm. During periods of low wind speed (under 10 mph) or wind which exceeds the designed blade operation load (over 44 mph), the blades would be feathered. In a feathered position, the blades are designed to withstand wind velocities of 125 mph.

The blade is attached to a drive-train assembly which transfers power to an induction motor. The entire assembly is enclosed in a fiberglass nacelle. The assembly rotates on a yaw bearing on top of the tower with rotor orientation controlled automatically by the directional force of the wind on the blade.

A picture of the WTG is shown in Figure 2-4 and turbine specifications are provided in Appendix B.

Control Functions: The windfarm's overall control system consists of a microprocessor in each machine and a central computer. The microprocessor uses a variety of inputs that reflect each turbine's environment and performance to independently control its start-up operation and shutdown.

FIGURE 2-4 U.S. Windpower



The central computer is in continuous communication with each machine and has monitoring, programming, and overriding capabilities that permit control of all machines from one location.

The rotation of the rotor is controlled by a pitch control device that adjusts the pitch of the blades based on inputs from anemometers sited throughout the wind farm and a tachometer that measures the rpm of the high speed shaft. When thresholds on a variety of variables (e.g., tower vibration, generator temperature, etc.) are reached or exceeded this pitch control mechanism operates in a failsafe mode and drives the blades to feather in approximately 203 rotations, reducing stresses on the windmill and preventing catastrophic failures.

Circuit breakers and disconnect switches are located at each machine, on the transmission system at every fourth to sixth machine, and at the substation. In the event of a phase imbalance, an overcurrent balance monitor in the central control system can disconnect individual machines, groups of machines, or the entire wind farm from the utility's grid.

The voltage and frequency of the power being delivered to the grid would be monitored on a continuous basis by the wind farm's central computer.

Safety Features: The WTG's electrical system is in compliance with the National Electrical Code. In addition, each tower is grounded in a manner comparable to that used in standard utility practice for towers carrying high voltage transmission wires to protect service personnel.

Control, Shop, and Warehouse Facility

A maintenance and control building (exact location unknown) would be built on public lands to house the installation's controls, spare parts, and maintenance equipment.

The facility would include a total of 42,000 square feet, including 22,000 square feet of parking space for on-site vehicles.

An off-site regional office building would be acquired to accommodate 4 to 6 administrative and construction supervisory personnel.

Security of Facilities and Equipment

The perimeter of each WTG site would be fenced and security patrols provided during the construction phase of the project.

Pre-Construction Activities

Land surveys and soil testing would be conducted prior to construction of facilities. Two to four holes, 10 feet deep and 5 feet in diameter, would be excavated each square mile to test for soil conditions (see Windfarm's project description, page 2- 5).

Construction Activities

Construction of the wind farm would occur in the sequence as described below. Acreage requirements are summarized in Table 2-2. Appendix G shows the installation of over 100 USW 56-50 wind turbine generators at Livermore, California.

TABLE 2-2

ENERGY PRODUCTION AND LAND DISTURBANCE ^{1/}

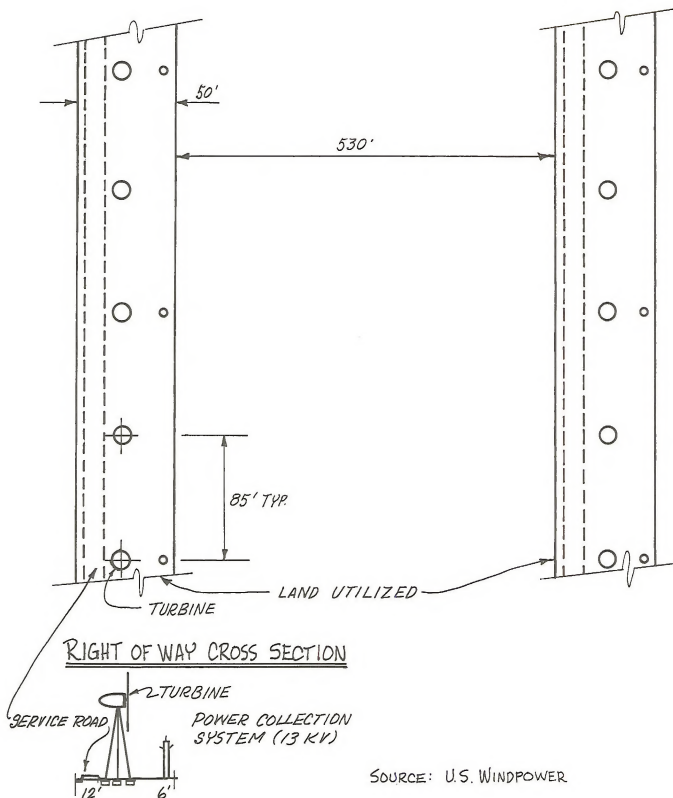
U.S. WINDPOWER

	Phase I	Phase II	Phase III	Total
Number of Turbines	900	350	1500	2750
Type of Turbines	---USW 5G50---			
Power Generation (Million kwh)	180.0	52.5	255.0	475.5
Wind Turbine Generators				
Temporary Disturbance Construction Site (acres)	41.3	16.1	68.9	126.3
Maintenance Yards (acres) ^{2/}	0.1	0.0	0	0.1
Permanent Disturbance Tower Base (acres)	4.6	1.8	7.6	14.0
Maintenance and Control Building (acres) ^{2/}	1.0	0	0	1.0
Roads				
New Road (miles) (acres)	17.2 25.0	7.5 10.9	25.7 37.4	50.4 73.3
Upgraded Roads (miles) (acres)	2.9 4.2	1.7 (0.2) 2.5	0 0	4.6 (0.2) 6.7
Transmission Line System				
33 kV Overhead Lines (miles)	1.2	0.1 (1.1)	0 (0.5)	1.3 (2.2)
Temp Disturbance (acres)	0.4	0.1	0	0.4
Perm Disturbance (acres)	0.1	0.1	0	0.1
12 kV Overhead Lines (miles)	19.6	8.5	24.7	52.8
Temp Disturbance (acres)	2.1	0.9	2.6	5.6
Perm Disturbance (acres)	0.1	0.1	0.1	0.1
Substations (acres)	0.4	0.4	0.4	1.3
Total Temporary Disturbance (acres)	46.0	17.0	71.5	134.5
Total Permanent Disturbance (acres)	35.3	15.7	44.8	95.8

^{1/} Figures in parentheses are for private lands. All other acreage and mileage figures are for public lands.

^{2/} Site undetermined.

FIGURE 2-5
Site Layout - U. S. Windpower



SOURCE: U.S. WINDPOWER

Construction of Access Roads

Approximately 50 miles of unpaved access road would need to be constructed for the operation and maintenance of the proposed wind farm. These roads would be located within the 50 foot right-of-way used for WTGs and transmission line facilities as shown in Figure 2-5, unless conditions, such as adverse topography, the need to avoid sensitive resources, potential safety hazards, or requirements of the landowners dictate otherwise.

Site Preparation

Site preparation for the windmills would involve vegetative clearing of a circle no more than 50 feet in diameter or about 2,000 square feet in total, and either drilling to a depth of 8 to 12 feet with an auger for the friction pier foundation or excavating with a backhoe for the spread foundation. The friction pier foundation would involve removal of about 3 cubic yards of earth per tower. The spread foundation would involve removal of about 18 cubic yards of earth per tower. The friction pier type would be used for all towers except those where the depth to bedrock is relatively shallow and does not permit drilling to the required depth. Excavation of a 4.5 foot deep, 12 inch diameter area between the tower's legs would also be required for the foundation for the downtower electrical box.

Installation of Tower Foundations and Ground-mounted Electrical Boxes

Installation of tower foundations involves construction of reinforcing steel cages and wooden forms at the site, placement of the cages and forms in and over areas excavated for the foundation, pouring concrete into these areas and stripping of the wooden forms. Installation of downtower electrical boxes involves the placement of a steel H-beam in the excavated area described above and pouring concrete into this area.

Installation of Power Collection and Communication Systems

Power from each wind turbine generator would be transmitted through a transformer located adjacent to the tower foundation. The 480 volt 12 kV transformer would step up power to line capacity for transmission to a central substation servicing the facility.

Installation of the above ground transmission system would involve drilling holes for wooden utility poles, placing the poles in the holes, backfilling with soil, installing appropriate insulators and transformers on the poles and stringing wire between the poles. It is expected that one pole would be required for every 2 to 4 windmills depending on terrain conditions.

The construction of the overhead transmission line would follow a sequence similar to that described for the Windfarm's Project. Design characteristics of the transmission lines and pole structures are included in Appendix F.

Tower Assembly and Erection

This stage would involve transporting the tower's components to the site, off-loading the components at each foundation site, assembling the tower on the ground, hoisting it into place and attaching it to the foundations with anchor bolts.

Turbine Installation

Turbine installation would involve transporting the wind turbines to the site, off-loading them at the control building, running each turbine through a complete electrical and mechanical test routine, transporting the turbines to their towers, hoisting the turbine to the top of the tower and bolting the turbine's yaw bearing to the mount at the top of the tower.

Blade Installation

Blade installation would involve transporting three blades to each tower with a flatbed truck, hoisting the blades and fastening them to the turbine's hub.

Interconnect and Check-Out

The power collection system would be checked for safety and correct grounding and then connected to the wind turbine. After interconnect, a series of tests of the electro-mechanical drive system and the communication capabilities of each windmill's microprocessor and the central computer are run. Then the windmill would be put on-line and checked for power balance on the blades. Upon successful completion of all tests, the windmill would be entered into the maintenance log and kept ready to generate power.

Temporary Use Areas

A temporary area, 100 feet by 50 feet in size, adjacent to an access road would be developed in each major project area to serve as on-site reporting locations for workers and on-site parking for vehicles and equipment.

Construction Personnel and Equipment

Approximately 16 persons would be employed during the first phase of development. The maximum number of construction personnel on the project at any time would be approximately 25. It is anticipated that contractors hired by USW to perform the construction would be based in the area and would draw their workers from the local work force.

The number of workers and types of equipment required to complete the proposed wind farm are shown in Appendix D.

Source of Construction Material

All electrical equipment needed to construct the transmission line system such as transformers, switchgear, meters, and insulators; concrete; reinforcing steel rods; steel and wooden poles; and transmission and communications wire; would be procured from local suppliers.

Operation and Maintenance

Operation would require that each machine be visibly scanned at least once each hour. This would involve two persons traveling throughout the wind farm at all times in communication with an individual at a central location who would be monitoring the windmills through a closed circuit television system. In addition, all of the machines would be continually monitored by a central computer that would provide an alert to any significant change in any individual machine's behavior.

Routine maintenance requirements would require an additional 5 persons per 200 machines to maintain the central computer and perform routine preventative maintenance. A total of 70 employees would be needed for the entire installation.

Transmission Line System

The description of the applicant's internal power collection system, including land use requirements, is described under "Construction" above.

Two additional facilities would be required to connect the wind farm to Southern California Edison Company's (SCE) utility grid:

- A 33:13 kV substation would step up the voltage of the power collection system to voltages required for transmission to SCE's substation located at Levers. One substation would be required for each phase of the project and would be located on lands managed by BLM.

Site preparation for each substation would involve clearing and leveling a 100 foot by 200 foot area. The area would then be provided with an engineered fill and the soil compacted. Transformer pads, an oil sump and various other equipment would be installed.

- A 33 kV transmission line would connect the wind farm's substation to the nearest SCE substation. Phase 1 and 2 of the facilities would be connected to the Whitewater Substation located just to the southwest of the intersection of Highway 10 and Tipton Road. Phase 3 would be connected to the Garnet Substation located about one-half mile due north of the intersection of Indian Avenue and the Southern Pacific Railroad.

SOUTHERN CALIFORNIA EDISON

Southern California Edison has applied on behalf of six private developers to develop six "wind parks" for energy production on 3,390 acres of public land. The six private developers would include:

- 1) Boeing -- Five 2.5 megawatt turbines producing 12.5 megawatts of power on 160 acres;
- 2) Bear Sterns/Bendix -- Five 4.5 megawatt turbines producing 22.5 megawatts of power on 220 acres;

- 3) WECS Tech -- 55 100-kilowatt turbines producing 5.5 megawatts of power on 300 acres;
- 4) U.S. Windpower -- 100 50-kilowatt turbines producing 5 megawatts of power on 320 acres;
- 5) Westinghouse -- 60 500-kilowatt turbines producing 30 megawatts of power on 1,200 acres; and
- 6) Ventus -- 200 towers mounting a total of 800 37.5-kilowatt turbines producing 30 megawatts of power on 1,190 acres.

The six wind parks would together produce 105.5 megawatts of power, and have an annual output of 261 million kilowatt hours.

Each manufacturer or developer has the right to refuse a parcel of land selected for him by Edison if the wind resource is unsuitable or for various other reasons. In the event that this should happen, SCE would amend their application to allow development with another manufacturer or developer.

Southern California Edison would design, construct and maintain all transmission facilities needed for the project in accordance with generally accepted utility practice.

Five of the six wind park proposals are described in detail below. Map 2-3 identifies the locations of the parks, turbines, and other facilities. Table 2-3 presents a summary of land uses. U.S. Windpower has filed a separate application with BLM to develop the same section of public land. Their application is described on page 2-12.

Boeing Engineering and Construction Company

The Boeing Wind Park would consist of five MOD-2 BWT-2560 wind turbine generators. The applicant has requested that one MOD-5 be substituted for one of the MOD-2's if engineering and production facilities can be completed in time; however, specifications are not yet available as engineering has not yet been completed. The wind park would include transmission lines, a substation, a new access road and improvement of an existing access road.

Construction would proceed in the spring of 1983 and last through 1984 (see Construction Schedule in Appendix A).

Wind Turbine Generator

The MOD-2 wind turbine generator has been described in the description of the Windfarms, Ltd, application, see page 2-1.

Control, Shop and Warehouse Facility

A control building and shop/warehouse facility would be constructed adjacent to the proposed substation on public land. Access would be provided by the access road. The facility would occupy an area of 2,500 square feet with an additional area provided for outside storage and parking.

Security of Facilities and Equipment

Security provisions would include fencing each WTG and power conditioning equipment, fitting WTG tower doors with locks and intrusion alarm, and if, necessary, contracting with local law enforcement agencies.

Construction Activities

Construction methods would generally be the same as that described in the Windfarms application. Each WTG site would consist of a leveled area having one dimension large enough to allow on-ground assembly of the rotor. The rotor length, crane setback dimension, 25-foot wide access road width and circulation space would combine to create a flat pad, generally elliptical in shape, with minimum central dimensions of 150 feet wide and 350 feet long (see Figure 2-3).

Based on site conditions, from 5,000 to 10,000 cubic yards of earth would have to be moved to create a WTG site. The excavated material could be used to construct a dike which would be needed to protect the site from periodic flooding. The slope of the dike would be between 2:1 and 3:1 and would be reinforced with riprap as required. If necessary, the wind turbine towers would be constructed on piers placed above the high water level.

Temporary Use Areas: Temporary facilities required during construction of the project would include field offices, sanitation facilities, security, and warehousing space.

Construction Personnel and Equipment

Construction labor would be provided by either Edison construction crews, a construction contractor, or drawn from the local labor force. These needs are identified in Appendix D.

Source of Construction Materials

Material needs would be similar to Windfarms (see page 2-9).

Operation and Maintenance.

The wind park would initially have a start-up crew on site during the period the machine is running. After completion of testing this crew may either remain on site or be removed depending on whether the machines can be operated by Edison substation personnel. Maintenance requirements would be the same as described in Windfarm's application.

Access Roads

Approximately 1.3 miles of new access road would be built from an existing road through the park to the substation. This road would be gravel surfaced with a minimum 12 foot road width. The existing road would be modified and realigned where necessary to provide room for construction equipment. A cross section of a typical access road is presented in Appendix D.

TABLE 2-3
ENERGY PRODUCTION AND LAND DISTURBANCE 1/
SOUTHERN CALIFORNIA EDISON

	Boeing	Bear Sterns/ Bendix	WECS Tech	Westinghouse	Ventus	Total
Number of Turbines	5	5	55	60	(200 Towers) 800	(325 Towers) 925)
Type of Turbines	MOD-2	BX-WTG-U	WT-605-HAWT	WWG-0500	Ventus	
Power Generation (Million kwh)	41.2	33.8	7.0	80.0	83.7	245.7
Wind Turbine Generators						
Temporary Disturbance Construction Site (acres)	6.0	6.0	3.3	9.3	5.5	30.1
Maintenance Yards (acres) <u>2/</u>	1.0	1.0	1.0	1.0	1.0	5.0
Permanent Disturbance Tower Base (acres)	1.2	1.2	0.3	0.9	0.2	3.8
Transformer Pad (acres)	0.2	0.2	0.0	0.0	0.0	0.4
Maintenance and Control Building (acres) <u>2/</u>	0.1	0.1	0.1	0.1	0.2	0.5
Roads						
New Road (miles)	1.0 (0.3)	0.5 (0.2)	1.1	4.0	15.9 (0.4)	22.5 (0.9)
(acres)	3.0	1.5	3.3	12.1	48.2	68.1
Upgraded Roads (miles)	0.0	0.4 (1.1)	0.7 (0.3)	0.8 (0.3)	0.3 (2.0)	2.2 (3.7)
(acres)	0.0	1.2	2.1	2.4	0.9	6.6
Transmission Line System						
33 kV Overhead Lines (miles)	0.0 (1.0)	0.0 (1.9)	0.0 (1.3)	0.5 (0.5)	0.5 (1.8)	1.0 (6.5)
Temp Disturbance (acres)	0.0	0.0	0.0	0.2	0.2	0.4
Perm Disturbance (acres)	0.0	0.0	0.0	0.1	0.1	0.1
Underground Lines (miles)	0.8	0.6	1.4	10.0	17.0	29.8
Substations (acres)	0.1	0.1	0.1	0.1	0.1	0.5
Total Temporary Disturbance (acres)	7.0	7.0	4.3	10.5	62.2	91.0
Total Permanent Disturbance (acres)	4.6	4.2	5.9	16.5	54.2	85.4

1/ Figures in parentheses are for private lands. All other acreage and
mileage figures are for public lands.

2/ Site Undetermined.

Transmission System

The power from each wind machine would be collected at 4160 volts and transmitted to a 33 kV substation through 0.8 miles of underground power line. The substation would be a steel-constructed facility located on a 60 x 35 foot parcel secured by an eight foot chain link fence. It would contain a 14 MVA, 33 kV/12 kV or 4 kV transformer, one 33 kV line position with circuit breaker, protection and metering.

From the substation power would be transmitted at 33 kV to the existing Whitewater Substation. Design characteristics of the transmission line and substation are included in Appendix F.

Bear Stearns/Bendix

The Bear Stearns/Bendix Wind Park would consist of five BX-WTG-U wind turbine generators on 220 acres of public land in the San Geronio Pass (Map 2-3). Construction would start in 1983 and be completed in mid-1984. The project would include transmission lines, a substation, access road and improvement of an existing access road.

Wind Turbine Generator

Design Characteristics: The Bendix BX-WTG-U is a three-bladed, turbine with a 260-foot rotor mounted on a 180-foot tall tubular steel structure with a flared base section connected to a reinforced concrete foundation. The total height of the structure is 310 feet with the blade in a vertical position. Each turbine produces 4,500 kw at its rated wind speed of 34 mph.

The rotor assembly is designed to rotate at a speed of 25 rpm. During periods of low wind (under 10 mph) or wind which exceeds the designed blade operation load (over 55 mph) the turbine will automatically shut down.

The blade hub is attached to a high-torque, low-speed shaft, from which rotation is transferred to an induction generator. The entire assembly is enclosed within a nacelle and attached to the top of the tower allowing orientation to the wind direction.

A picture of the WTG is shown in Figure 2-6 and turbine specifications are provided in Appendix B.

Control Functions: The control system is based on temperature and pressure switches (and similar sensors for other physical properties) which interconnect to directly control the valves operating the control mechanism. There are three major components of the control system: tower yaw, blade pitch angle, and synchronization/shut-down controls.

The electrical power controls associated with the generator include a circuit breaker which connects generator output to the power lines, a field current relay, a voltage regulator, and a generator speed switch. A conventional complement of time delay components and protective devices is included to insure proper sequencing and to remove the generator from the line safely in case of such unwarranted events as loss of field, over-current, excessive reverse power, or excessive generator ground current.

Safety Features: The wind turbine is designed to shut down if a malfunction is indicated with any one of the following factors: rotor rotational speed, blade stress, hub stress, power train vibration and temperature, grio status and power output.

The manufacturer has estimated that in the unlikely event a blade is thrown the maximum distance it would be carried is 300 to 375 feet.

Control, Shop and Warehouse Facilities

No control, shop, or warehouse facilities would be constructed. Control facilities would be located within the tower at the base. Shop and warehouse facilities would be located off site.

Security of Facilities and Equipment

Security provisions would include either perimeter fencing for the entire wind park or fencing for each wind turbine, lighting, and an alarm system for each WTG.

Construction Activities

Site preparation would consist of clearing and grading a flat area approximately one acre in size for the wind turbine generator and foundation.

Following site preparation, excavation and foundation installation, the tower would be erected. The tower structure would consist of a welded steel cylindrical structure which would be assembled onsite in sections, using the crane, and welded together. Following erection of the tower the nacelle would be assembled and installed. Electrical equipment cables, transformer and switch gear would be installed and connected to the unit. Blades would be installed and secured. All electrical, controls, and mechanical systems would be checked prior to start-up.

All other pre-construction, construction, operation and maintenance procedures would be as described for SCE-Boeing.

Access Roads

An existing 1.5 mile gravel road connects the site with an existing paved street. This road would be modified and realigned to provide a minimum 12 foot width and adequate turnarounds and guardrails. Within the site, a road approximately 0.7 miles long would be built to the same standards to provide access to the turbines.

Transmission System

The power from each wind machine would be collected at 4160 volts through 0.6 miles of underground power lines to a 33 kV substation. This substation would be located in the southeast quarter of Section 2, T.3S., R.3E.

From the substation, power would be transmitted at 33 kV to the existing Whitewater Substation. The line would be wood pole construction with a pole height of approximately 45 feet and typical pole spacing of 300 feet.

FIGURE 2-6 Bendix WT6-U



Design characteristics of the transmission line and towers are included in Appendix F.

WECS Tech Corporation

The WECS Tech Wind Park would consist of 55 WT-605-HAWT wind turbine generators on 300 acres of public land (Map 2-3). The wind park would include transmission lines, a substation, access roads and improvement of existing access roads.

Construction would start in 1982 and be completed near the end of 1983.

Wind Turbine Generator

Design Characteristics: The WECS Tech WT-605-HAWT is a three-bladed, downwind WTG with a 58-foot rotor mounted on a 75-foot tall steel column tower supported by eight cable guy wires. The total height of the structure is 110 feet with the blade in a vertical position. Each turbine produces 100 kW of power at its rated wind speed of 28 mph.

The blade is attached to a high-torque, low-speed drive shaft, from which rotation is transferred through a conventional gearbox to an induction generator. The drive train assembly is enclosed in a nacelle which is mounted to the top of the tower to allow rotation in response to changes in wind direction. The rotor is designed to rotate at a constant speed of 60 rpm. A diagram of the WTG is shown in Figure 2-7 and design specifications provided in Appendix B.

Control Functions: Automatic yaw with fail-safe brake application and release. Circuit breakers will provide overcurrent control.

Safety Features: The electrical system has been designed to comply with the National Electrical Code. Lightning protection has been provided for all circuits and the wind turbine structure. Blades are lightweight and low-stressed resulting in a low probability of blade throw. However, if a blade failure were to occur, the maximum distance that the blade could be thrown is expected to be less than 175 feet.

Control, Shop and Warehouse Facility

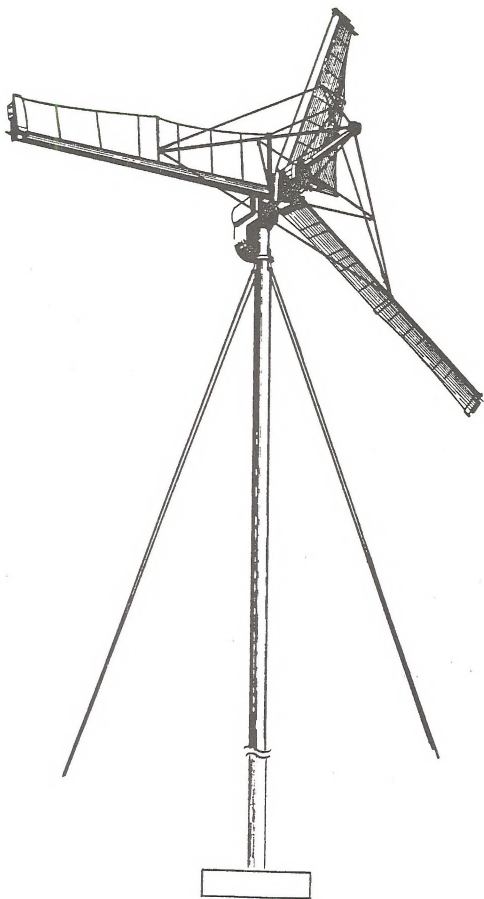
A control building and shop/warehouse facility would be constructed adjacent to the substation on public land. Access would be provided by construction of a new access road.

The facility would cover an area of approximately 2,000 square feet. Maintenance, minor instrument repair, and storage of small parts would be the main purpose of the facility. Control panels and instrumentation would also be contained within the building.

Security of Facilities and Equipment

The base of each tower would be fenced to protect the WTG from vandalism. Secure ground level access to the tower interior would be assured by a locked latch with an unauthorized intrusion alarm. All surface-mounted power conditioning equipment would also be enclosed to limit vandalism and provide a safe installation.

FIGURE 2-7
WECS Tech WTG



A chain link fence would provide security during construction. An alarm system would be added if needed.

Construction Activities

Site preparation would consist of clearing and leveling an area of approximately 2,600 square feet at each WTG location.

Following site preparation, excavation and foundation installation, the tower would be erected. The structure would be set in place using a crane and supported by guy cables attached at elevations of approximately 45 feet and 75 feet along the length of the tower. The nacelle would be lifted into place as an assembly. Electrical equipment cables, transformer and switch gear would be installed and connected to the unit. Blades would be installed and secured. All electrical, control, and mechanical systems would be checked prior to start-up.

Access Roads

An existing 0.7 mile gravel road connects the site with an existing paved street. This road would be modified and realigned with a minimum 12 foot width where necessary. Additionally, approximately 1.1 miles of surfaced road would be constructed to provide access to each of the wind turbine generator rows.

Transmission System and Substation

Power from each wind turbine would be collected at 480 or 4160 volts through 1.4 miles of underground power lines to a 33 kV substation. From the substation, power would be transmitted at 33 kV to the existing White-water Substation, a distance of 1.3 miles. The line would be wood pole construction similar to that described previously. Design specifications can be found in Appendix F.

Westinghouse Electric Corporation

The proposed Westinghouse wind park would consist of sixty 500 kW wind turbines located on 1,200 acres in San Geronio Pass (see Map 2-3). The park would include transmission lines, a new substation, and improvement to existing access roads. Construction would take place from early 1983 through late 1985 (see Construction Schedule, Appendix A).

Wind Turbine Generator

Design Characteristics: The Westinghouse WWG Q500 SSC is a two bladed, downwind WTG with a 125-foot rotor mounted on a 93-foot tall pipe struss tower bolted to a reinforced concrete foundation. The total height of the structure is 163 feet with the blade in a vertical position. Each turbine produces 500 kilowatts of power at its rated wind speed of 28 mph.

The rotor assembly includes two wooden blades, each 60 feet long weighing 5,200 pounds. The blades are fitted to a hub and designed to rotate at a constant speed of 42 rpm. Blade pitch can be changed from fully feathered to a 96 degree angle. In a feathered position, the blades are designed to withstand wind velocities of 150 mph.

The blade hub is attached to a high-torque, low-speed shaft, from which rotation is transferred through a high-speed gearbox and high-speed shaft to a generator. The entire assembly is enclosed in a fiberglass nacelle and mounted to the top of the tower through a gear and bearing assembly, which allows the unit to rotate 360 degrees.

A picture of the WTG is shown in Figure 2-8 and turbine specifications are provided in Appendix B.

Control Functions: There are five major components of the control system: Microprocessor, blade-pitch control, yaw control, safety shutdown system, and supervisory control. The microprocessor tracks wind speed, starts the wind turbine from rest, brings it up to speed and synchronizes it with the utility grid. It makes appropriate adjustments to maximize the energy capture of the wind. The yaw control system senses wind speed and direction from an anemometer on top of the nacelle, monitoring the yaw error between wind and nacelle direction. The turbine is yawed whenever the error exceeds 25 degrees for an extended period of time.

Safety Features: The electrical features have been designed to comply with the National Electrical Safety Code. Should the wind speed vary drastically, the microprocessor automatically shuts down and secures the turbine. Located on an extension of the high-speed shaft is a brake system which will stop the rotor in case of a system failure. This is part of the safety shutdown system, which operates independently of all other wind turbine controls. Blade throw is expected to be 375 feet or less.

Control Shop and Maintenance Facility

A maintenance building located near the wind park would be the center of system operations. It would function as the following: a store house for spare parts and materials, a shop for repair or inspection of components, and an office for bookkeeping, ordering, procurement, shipping, receiving, records, etc.

The control station for supervisory control and monitoring of the wind turbines would be located in the maintenance building. This station would enable technicians to constantly monitor the operating status of each wind turbine.

Security of Facilities and Equipment

To safeguard against vandalism, an 8-foot high chain link fence would enclose each WTG site. Also, an intrusion alarm system consisting of magnetic switches on the control room door and foil protector tape on the door window would provide automatic alarm and shutdown. Should further security measures be required, security guards would be provided.

Construction Activities

Each WTG would be sited on a graded pad approximately 0.2 acres in size. Preliminary excavation estimates indicate no more than 300 cubic yards of earth would need to be moved to create a typical WTG site. Excavated material would be utilized to create the WTG pad whenever permitted by soils and engineering recommendations. Otherwise, excavated material would be used in the construction of access roads.

FIGURE 2-8 Westinghouse WWG-0500



Because of the site's location in relation to the Whitewater floodplain, the applicant may need to build a dike around the site to protect it from periodic flooding. The dike would be reinforced with riprap where necessary.

Following site preparation, excavation and foundation installation, the tower would be erected. The rigidly designed pipe truss structure would be bolted to a reinforced concrete foundation, assembled in sections and lifted into place with a crane for welding. The nacelle assembly would be lifted into place with the crane for installation. Electrical equipment cables, transformer and switch gear would be installed and connected to the unit. Blades would be installed and secured. All electrical, controls and mechanical systems would be checked prior to start-up.

Operation and Maintenance

Preventive maintenance would be carried out on a regular basis, including inspection, cleaning, lubrication, and replacement of WTG components. A routine inspection of other wind park facilities would take place on a monthly basis.

Corrective maintenance would be performed by personnel manning the facility on a 24-hour basis.

Access Roads

An existing 1.1 mile gravel road connects the site with an existing paved street. This road would be modified and realigned to conform to the standard minimum 12 foot width. Adequate turnarounds and guardrails would be provided at proper locations. An additional 4 miles of surfaced road would also have to be constructed to provide access to each of the WTG rows.

Transmission System

The power from each wind machine would be collected at 4160 volts through approximately 10 miles of underground power lines to a 4160 to 33 kV substation. This unattended substation will be located in the southeast corner of Section 22, T.3S., R.4E., as shown on Map 2-3.

From the substation, power would be transmitted approximately one mile to the Garnet Substation (Appendix F).

Ventus Energy Corporation

The Ventus wind park is proposed on 1,190 acres of public land just north of Palm Springs (see Map 3). It would consist of 800 Ventus wind turbines mounted on 200 towers (4 units per tower) and would include transmission lines, a substation, access roads and improvement of an existing access road (see Table 2-4). Construction would take place from late 1982 through mid-1985 (see Construction Schedule, Appendix A).

Wind Turbine Generator

The Ventus WTG is a three-bladed, downwind turbine with a 31-foot rotor. Four rotors are mounted on a 100-foot tall, tubular steel tower which is bolted to a concrete foundation. The total height of the windmill struc-

ture is 102 feet (see specifications, AppenoiX B, and illustration, Figure 2-9). The blade is attached to a drive-train assembly which includes the generator enclosed in a nacelle. The nacelle is mounted on an arm attached to the side of the tower. Each turbine would produce 37.5 kilowatts of power at its rated wind speed of 30 mph; each tower accordingly produces 150 kW.

Each turbine is equipped with three 15-foot blades made of a composite material (glass, fiber and polyester resin) attached to a rigid hub with a cone angle of five degrees. The blades are designed to rotate at a constant speed of 107/214 rpm. Although no brake system exists, a passive pitch control system using the blade aerodynamics keeps the machine from overspeed.

The blade hub is attached to a shaft from which rotation is transferred through a gearbox to a variable torque generator. The drive train is enclosed in a nacelle.

Control Functions: There are two major components of the control system: a "free yaw" system and the passive pitch control system.

Safety Features: All equipment is designed to comply with National Electrical Code regulations. The system is protected against lightning strikes.

Sensors designed to detect overspeed, overcurrent, overvoltage and excessive vibration are installed on each machine. These sensors can shut the machine down if hazardous conditions are encountered.

Blade throw probability is expected to be very low, and the danger from a thrown blade should be minimal due to their small size and light weight. However, if blade failure were to occur, the maximum distance the blade would be thrown is expected to be less than 100 feet.

Control, Shop and Warehouse Facility

A control building and shop/warehouse facility (CSW) would be constructed adjacent to the proposed substation on public land. Access would be provided by an existing facility.

The facility would cover an area of approximately 10,000 square feet. The shop area would be used for maintenance and minor instrument repair and the warehouse area for storing small parts, consumable items and spare rotor blades. The remaining area would be used for control equipment and instrumentation. A parking facility would be provided adjacent to the CSW.

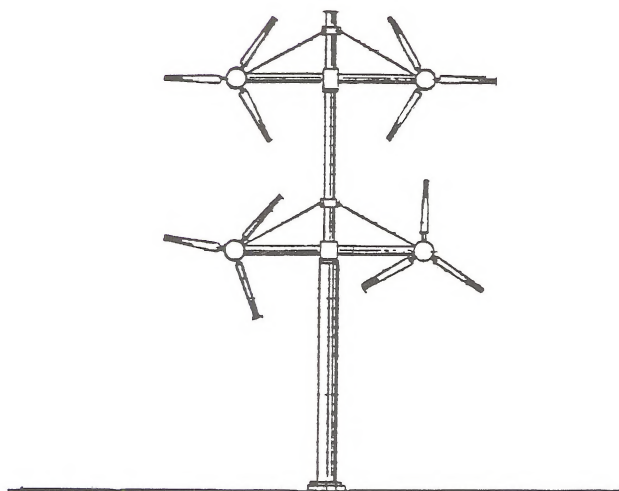
Security of Facilities and Equipment

The site would be completely fenced and manned 24 hours a day in order to minimize vandalism and mitigate the safety hazard to the general public.

Construction Activities

An area of approximately 1,200 square feet (30'x30') would be cleared of vegetation at each WTC site. Little or no excavation would be required during the site preparation phase.

FIGURE 2-9
Ventus WTG



Following site preparation and foundation installation, the tower would be erected. The tubular steel tower would be set in place with a crane. Each of the four rotors would be installed with its corresponding nacelle and guyed to the tower. Electrical equipment cables, transformer and switch gear would be installed and connected to the unit. All electrical, control and mechanical systems would be checked prior to start-up.

Operation and Maintenance

The site would be manned at all times. Routine maintenance would be accomplished through the use of a cherry-picker. Major maintenance items might require the use of a crane.

Access Roads

An existing 2.3 mile gravel road connects the site with an existing paved street. This road would be modified and realigned to meet design specifications. Adequate turnarounds and guardrails would be provided at proper locations.

In addition approximately 16 miles of surfaced roads would be constructed to provide access to each WTG row. Approximately 48 acres would be directly impacted by road construction.

Transmission System and Substation

Power from each wind turbine would be collected at a transformer located adjacent to the WTG and transmitted at 480 or 4160 volts through approximately 17 miles of underground power lines to a 33 kV substation. This unattended substation would be located in the northeast corner of the development as shown on Map 2-3. The technical feasibility of providing intermediate step-up transformers and total undergrounding would be evaluated during final design.

From the substation, power would be transmitted on overhead lines to the substation at Garnet. This line would be approximately 2.3 miles in length and be of wood pole construction. Each pole would be 45 feet high with a typical pole spacing of 300 feet. Design specifications would be similar to that described previously (see Appendix F).

PANAERO

PanAero Corporation proposes to construct a total of 309 wind turbines on 9,270 acres of public land. Ultimate annual energy production is projected to be 1,177 million kilowatt hours. Development would occur in four phases:

- (1) Desert Hot Springs: sixty-two 500 kW machines and twenty-seven 4 MW machines generating 142.5 megawatts of power located on 2,160 acres.
- (2) Whitewater Canyon: ninety-seven 500 kW machines and twenty-eight 4 MW machines generating 160.5 megawatts of power located on 4,380 acres.

- (3) Seven Palms Valley: forty-seven 500 kW machines and sixteen 4 MW machines generating 87.5 megawatts of power located on 2,080 acres.
- (4) Cathedral City: nineteen 500 kW machines and six 4 MW machines generating 33.5 megawatts of power located on 650 acres.

Construction of the first phase would begin in 1983 and would conclude two and one-half years later. Construction of the remaining phases would begin in 1985 with completion of all phases by early 1990 (see Construction Schedule, Appendix A).

The wind turbines would be sited along ridgetops in more rugged terrain and staggered locations in the flats, running perpendicular to the direction of the prevailing winds. The distance between the lines of wind turbines would vary with the terrain conditions. The locations of the facilities are shown on Map 2-4. In addition to the turbines, wind field development would require the construction of maintenance and control buildings at each site, access roads, overhead and underground transmission lines, and new substations to connect power generated from the field to existing overhead lines.

Wind Turbine Generators

Three types of wind turbine generators would be utilized at the site. These are the DAF Indal, Vertical Axis Wind Turbine, rated at 500 kW; the Westinghouse WVG-0500 SPA, rated at 500 kW; and the Hamilton Standard WTS-4, rated at 4,000 kW. The applicant believes a mix of turbine types could provide technological diversity and productive efficiency at each level of development. Characteristics of each unit are shown in Appendix B. Figures 2-2, 2-8, and 2-10 show diagrams of the proposed turbines. The DAF Indal is described in detail below; the Westinghouse and Hamilton Standard turbines have already been described in the SCE-Westinghouse and Windfarm's applications.

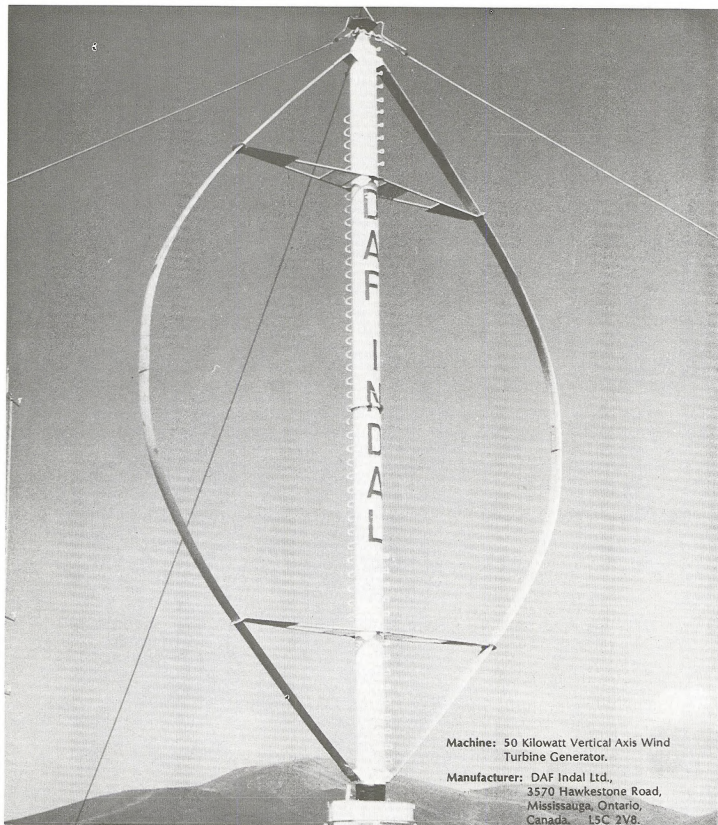
DAF Indal

Design Characteristics: The DAF Indal is a vertical-axis, darrieus-type WTG with two blades 142.4 feet long mounted on a 3 to 5 foot diameter, 120-foot tall tubular steel tower. The tower is in turn attached to a reinforced concrete, single caisson foundation.

The rotor assembly includes two extruded fiberglass blades each weighing 4,400 pounds which are designed to rotate at a constant speed of 45 rpm. The tower functions as a high-torque, low-speed drive shaft, from which rotation is transferred through a gearbox and high-speed shaft to an induction generator. The assembly is totally enclosed in a power module located beneath the wind turbines. The wind turbine is designed to produce 500 kilowatts at its rated wind speed of 43 mph.

Control Functions: The control system is primarily based on two units, a manual control protection and metering unit and an automatic control unit. The automatic control unit has a microprocessor which tracks and monitors wind speed, making appropriate adjustments to maximize the energy capture of the wind.

FIGURE 2-10 DAF Indal



Machine: 50 Kilowatt Vertical Axis Wind
Turbine Generator.

Manufacturer: DAF Indal Ltd.,
3570 Hawkestone Road,
Mississauga, Ontario,
Canada L5C 2V8.

Safety Features: The electrical systems of the DAF Indal have been designed to comply with the National Electrical Safety Code. If the wind dies down or fluctuates drastically, the system will decelerate the rotor and decrease power output to zero, thereby securing the wind turbine until adequate conditions reoccur. No information on blade throw potential is available.

Control, Shop and Warehouse Facilities (CSW)

There would be at least one maintenance and control building constructed for each phase of the project. The size of the building and its placement would vary with the size of the facility. They would be situated to provide maximum convenience for all maintenance and control requirements. There would be four large (180' X 40') buildings, one in each facility, and five smaller (100' X 40') buildings in Facilities II, III, and IV. Each building would include space for instrument displays, telecommunication and monitoring equipment, storage of site maintenance tools, materials, and equipment.

Meteorological Towers

Several meteorological towers (approximately thirty feet tall) would be installed prior to turbine construction along the proposed turbine rows, one per linear mile. Two tall towers (approximately 190 feet) would be installed during each phase. These tall towers together with five to seven of the lower towers would remain as permanent data stations after turbine installation.

Security of Facilities and Equipment

Each wind turbine generator site would be fenced. An alarm system consisting of magnetic switches on the control room door and a foil protector tape system on appropriate windows would provide automatic alarm and shutdown. A security patrol schedule would be established in coordination with the construction timetable.

Pre-Construction Activities

Land surveys and soil testing would be conducted prior to construction. These activities would be essentially the same as described for Windfarms on page 2-5.

Wind data collection would precede installation of the turbine. This data would be collected from automated battery powered stations located in meteorological towers (see above). Some data collection above these tower heights might be taken with temporary or portable instrument systems for a short period of time.

Construction Activities

Construction methods for the Westinghouse and Hamilton Standard wind turbines would be similar to those described for the SCE-Westinghouse and Windfarms proposals. Installation procedures for the DAF Indal would occur in the sequential steps as described below. Table 2-4 provides a summary of temporary and permanent acreage requirements associated with construction of the wind farm.

TABLE 2-4

ENERGY PRODUCTION AND LAND DISTURBANCE ^{1/}

PANAERO

	Facility I	Facility II	Facility III	Facility IV	Total
Number of Turbines	96	125	63	25	309
Type of Turbines	---DAF Indal/WWG-0500/WTS-4---				
Power Generation (Million kWh)	397.0	444.0	243.0	93.5	1177.5
Wind Turbine Generators					
Temporary Disturbance Construction Site (acres)	44.7	46.2	26.3	10.1	127.3
Maintenance Yards (acres)	1.5	4.5	4.5	3.0	13.5
Permanent Disturbance Tower Base (acres)	15.0	15.4	8.7	3.4	42.5
Maintenance and Control Building (acres)	0.2	0.4	0.4	0.3	1.3
Roads					
New Road (miles)	6.0	13.5 (0.4)	4.5 (0.1)	3.1(0.3)	27.1 (0.8)
(acres)	21.8	49.1	16.4	11.3	98.6
Upgraded Roads (miles)	0.0	1.8 (0.7)	0.0	0.0	1.8 (0.7)
(acres)	0.0	6.6	0.0	0.0	6.6
Transmission Line System					
33 kV Overhead Lines (miles)	7.7 (0.1)	12.5 (1.1)	5.4 (2.5)	2.3(0.3)	27.9 (4.0)
Temp Disturbance (acres)	1.3	2.1	1.0	0.6	5.0
Perm Disturbance (acres)	0.1	0.1	0.1	0.1	0.1
Substations (acres)	0.1	0.2	0.1	0.1	0.5
Total Temporary Disturbance (acres)	47.5	52.8	31.8	13.7	145.8
Total Permanent Disturbance (acres)	37.1	71.7	25.6	15.1	149.5

^{1/} Figures in parentheses are for private lands. All other acreage and mileage figures are for public lands.

Access Roads

Approximately 29 miles of access road occupying 73 acres of public land would be required for the construction, operation and maintenance of the proposed wind farm. The access roads would generally be located adjacent to transmission lines erected to service each of the WTG's.

Construction of the road would involve clearing, grading and graveling a 12 to 18 foot road bed running parallel to the lines of wind turbines. Figure 2-11 illustrates a typical site layout for location of the turbines, roads and transmission lines.

Site Preparation

A circle, approximately 160 feet in diameter, or 6,500 square feet in area, would be cleared of vegetation as needed around the center of each WTG to provide room for three sets of guy wires extending from the top of the turbine to the ground. A grader would then level a 125 square foot area around the proposed base of the turbine prior to foundation excavation. The caisson style foundation would result in the removal of about 33 cubic yards of earth per tower.

Installation of Tower Foundations and Electrical Connectors

Installation of tower foundations would involve the setting of steel reinforcing bars in and over areas excavated for the foundation and pouring concrete into these areas.

Wind Turbine Installation

After transporting each WTG to the site by truck, the power module would be mounted to the foundation and tested. The rotor assembly would then be assembled on the ground by bolting the column halves together and fitting the blades with struts and guy wires. The completed assembly would be lifted by one or more cranes and placed on top of the module. The construction period from start to finish would average about one week.

Installation of Power Collection and Transmission Line System

Power from each WTG would be transmitted through a transformer located at the base of the tower. The step-up transformer would increase the 460 volts of the WTG to an intermediate power collector voltage of 33 kV, at which point it would be transmitted over a set of overhead lines to several substations servicing the facilities. Where transmission does not occur along the access road, a 30 foot transmission line right-of-way would be required. This ROW would be cleared only as needed for surveying, assembly and erection of wood pole structures, and installation of conductors.

Each substation would be a low-profile, steel-constructed facility located on a 60 by 35 foot parcel of land secured by an eight foot high chain link fence. The station would include necessary protective relays, breakers, electrical grounding, remote control equipment, metering and safety devices.

Installation and construction of the transmission line system would be similar to that described for U.S. Windpower and the Windfarm's proposals. Design characteristics of PanAero's electrical transmission system are included in Appendix F.

Construction Personnel and Equipment

Individual manufacturers and construction contractors would have their own skeleton crews, with the remainder of the personnel to consist of local qualified workers. The workforce required during construction would vary from 125 to 170 depending on the number of machines to be constructed during each phase of the project. Appendix D lists the primary phases of construction and approximate number of employees and types of equipment needed.

Operation and Maintenance

The wind turbine generators have been designed for automatic unattended operation with a manual control override. Both would be available at the central control building. Personnel would monitor the facility's performance on a daily basis, and would perform scheduled and unscheduled equipment maintenance. Each machine is expected to require from 300 hours to 336 hours of maintenance per year. Special tools and spare parts to service the WTGs would be kept at the project site. Ground inspection of power lines would be accomplished every 6 to 12 months.

SAN GORGONIO FARMS

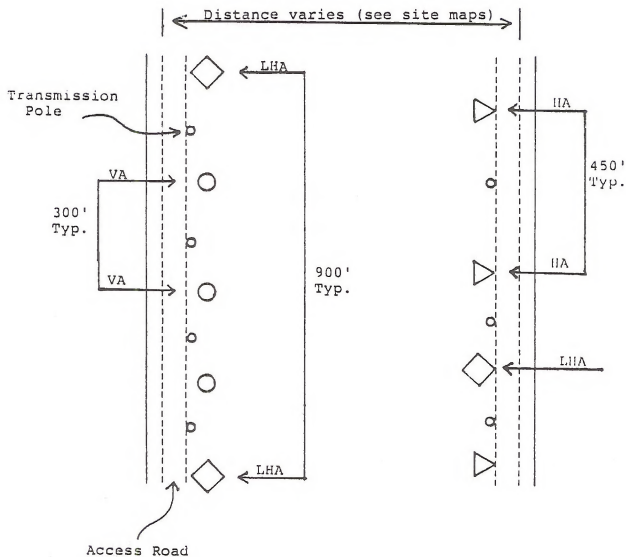
San Gorgonio Farms, Inc. of San Pedro, California proposes to erect a total of 95 wind turbines on approximately 280 acres of public land in Section 12, T.3S., R.3E., SBM. The company has also applied, in connection with property owned by it, for a public use permit in Riverside County to develop a wind farm immediately adjacent to and downwind of the 280 acres, on the west half of Section 7, T.3S., R.4E., SBM. Development on private land would consist of sixty 25 kW wind turbines, a 33 kV substation, and an interconnect to Southern California Edison's facilities.

Wind turbine development on public lands would occur in three phases. Phase I would be completed in 1983 and involve the construction of sixty 25 kW wind turbines generating 1.5 megawatts of power. During Phase II, thirty 125 kW wind turbines would be built generating 3.75 megawatts of power by mid-1984. Phase III, in 1986 would involve the construction of five 2.5 MW turbines. Map 2-5 shows the proposed arrangement of these units.

The electrical collection system on privately-owned land would be extended onto public land to collect the energy produced. Only minor graded service roads would be built to each WTG site for maintenance of the units.

It is estimated that with full development on private and public lands approximately 123 million kilowatt hours of electrical energy per year could be produced from these wind farms. Table 2-5 shows the amount of energy which could be produced.

FIGURE 2-11
PanAero Typical Site Layout



The applicant is applying for approval to develop the proposed wind farm on public land as well as to protect downwind wind rights on its contiguous, privately owned-lands.

Wind Turbine Generators

Three types of wind turbine generators would be used. These are the Carter CWG-25, rated at 25 kW, the Carter CWG-125, rated at 125 kW, and the Boeing MOD-2, rated at 2.5 MW. The Carter WTGs are described below; the Boeing WTG has already been described in Windfarm's application (page 2-).

Carter Wind Generator Model 25 (CWG-25)

Design Characteristics: The CWG-25 is a two-bladed, downwind, induction WTG with a 32-foot rotor mounted on an 80-foot high galvanized steel pole supported by four guy wires and attached to a concrete base. The total height of the windmill structure is 96 feet with the blades in a vertical position. Each turbine produces 25 kilowatts of power at its rated wind speed of 26 mph.

The rotor assembly includes two fiberglass blades, each 16 feet long, weighing 220 pounds and designed to rotate at a constant speed of 120 rpm. The blades are attached to a gearbox drive shaft, which transfers rotation through a speed increaser gearbox (1800 rpm). Torque is then transmitted to an induction motor by the output gearbox shaft. The entire assembly is mounted in the nacelle on the tower.

A picture of the WTG is shown in Figure 2-12 and turbine specifications are provided in Appendix B.

Control Functions: Yaw control is passive, essentially free yaw. Overload control is provided by blades that automatically stall in high winds -- again a passive system. Overspeed control is inherent in the design characteristics of the spar and blade, automatically causing the blade to pitch up and, after coning to 45 degrees, to stall, thus keeping the blades in a nonrotating condition in winds of 125 mph. The use of an induction generator allows the frequency phase and voltage of each machine's output to be determined by the utility grid, eliminating the need for phasing and voltage control devices. Breakers for overcurrent control are located on each unit and at the substation.

Safety Features: The electrical systems of the CWG-25 complies with the National Electrical Code. Lightning protection on all circuits is provided by lightning arrestors. The probability of blade throw is estimated to be negligible. The distance a blade would be thrown is unknown.

Carter Wind Generator Model 125 (CWG-125)

Design Characteristics: The CWG-125 is a two-bladed, downwind turbine using an induction motor. The rotor diameter is 65 feet mounted on a 120 feet high galvanized steel pole supported with four guy wires. The tower is anchored in concrete 4 feet by 6 feet by 5 feet with guy wires anchored in concrete pads 3 feet by 10 feet by 8 feet. The blades are fitted to a steel hub. The total height of the windmill structure is 155 feet with the blade in a vertical position. Each turbine would produce 125 kW of 60

FIGURE 2-12 Carter CWG-25



Hz alternating current at its rated wind speed of 30 mph. The physical features of the unit are similar to the Carter Wind Generator Model 25. The Model 125 is not yet in production; therefore, pictures of it are not available at this time.

The turbine has two fiberglass blades, each 32.5 feet long and weighing 800 pounds. The blades are designed to rotate at a constant speed of 75 rpm. Blade pitch control is passive, requiring no pitch change servo, pitch change bearings, or monitoring equipment to determine operator rpm, wind speed, or kW output.

The blades are attached to a gearbox drive shaft, which transfer rotation through a speed increaser gearbox (1838 rpm). Torque is then transmitted to an induction motor by the output gearbox shaft. The entire assembly is mounted in the nacelle on the tower. The system naturally weathervanes.

Control Functions: Identical to those described for the Carter 25.

Safety Features: The electrical systems of the CWG-125 complies with the National Electrical Code. Lightning protection on all circuits is provided by lightning arrestors. The probability of blade throw is estimated to be negligible.

Control, Shop and Warehouse Facilities

Public land would be used only for generator sites and collection system lines. The applicant's storage/service yard, substation, transmission lines, temporary use areas, and other facilities would be located on adjacent land owned by San Geronio Farms.

Pre-construction Activities

Land surveys and soil testing would be conducted prior to construction of WTG facilities. Eight to ten borings would be made on public lands to determine the soil structure. The depth of these borings would vary from 20 to 30 feet.

Construction Activities

Site Preparation and Foundation Installation

Site preparation for each WTG would involve vegetative clearing for service roads and approximately a 15 foot by 15 foot pad at each of the five foundations for each WTG. After each WTG is erected, only the service roads and the cleared pad at the center foundation would be maintained, the other four pads would be allowed to return to their natural state. Minimal grading would be required at each WTG site, because the five foundations would not have to be set to the same grade. Therefore, areas between foundations could be left in their natural condition.

Assuming maximum development of all sites and service roads in all three phases on public lands, approximately 18 acres of clearing would be required. Acres of site disturbance are 18 presented in Table 2-5.

TABLE 2-5

ENERGY PRODUCTION AND LAND DISTURBANCE ^{1/}

SAN GORGONIO FARMS

	Phase I	Phase II	Phase III	Total
Number of Turbines	60	30	5	95
Type of Turbines	CWG-25	CWG-125	MOO-2	
Power Generation (Million kwh)	5.0	13.0	41.22/	59.2
Wind Turbine Generators				
Temporary Disturbance Construction Site (acres)	1.6	0.8	6.0	8.4
Maintenance Yards (acres) ^{2/}	0.0	0.0	0.0	0.0
Permanent Disturbance Tower Base (acres)	0.2	0.1	1.3	1.6
Maintenance and Control Building (acres) ^{2/}	0.0	0.0	0.0	0.0
Roads				
New Road (miles)	3.2	2.3	0.7 (0.7)	6.2
(acres)	8.5	6.1	1.9	(0.7) 16.5
Upgraded Roads (miles)	0.0	0.0	0.0	0.0
(acres)	0.0	0.0	0.0	0.0
Transmission Line System				
33 kV Overhead Lines (miles)	3.2	2.3	0.7(0.7)	6.2 (0.7)
Temp Disturbance (acres)	0.1	0.1	0.1	0.1
Perm Disturbance (acres)	0.1	0.1	0.1	0.1
Underground Lines (miles)	2.0	0.0	0.0	2.0
Substations (acres)	0.0	0.0	0.0	0.0
Total Temporary Disturbance (acres)	1.6	0.8	6.0	8.4
Total Permanent Disturbance (acres)	8.7	6.2	3.2	18.1

^{1/} Figures in parentheses are for private lands. All other acreage and mileage figures are for public lands.

^{2/} Maintenance yards and control buildings would be located on private lands.

Wind Turbine Installation

The WTGs would be delivered to the project site preassembled by the manufacturer with the turbine and blades attached to the steel mast. The delivery truck would use the service roads and unload one unit at each WTG site. A 2-person crew with a pickup truck and hand tools would install one to two units each day. While the mast is lying on the ground, the four guy wires would be attached to it and bolted to the four anchor pads. The mast, with turbine, would then be hoisted into place by a small winch. The mast baseplate would then be attached to the foundation. Afterwards, all slack would be taken out of the guy wires.

Construction Personnel and Equipment

Each phase of the wind farm would require a construction work force of approximately 10 technical and common laborers. The maximum number of construction personnel on the project at any time would be approximately 17.

Most of the workers would be drawn from the local labor force and the remainder would be provided by a construction contractor hired by the applicant. The number of workers and types of equipment required to complete the proposed system are shown in Appendix D.

Source of Construction Material

It is anticipated that sands, gravels, and aggregates would be hauled from the Whitewater Canyon area, a distance of approximately 1 mile from the site.

Concrete would be hauled from one of the existing plants located in the Palm Springs area. Other construction materials, such as lumber and reinforcing steel, would be transported from within the Palm Springs/Desert Hot Springs area. The wind turbine units themselves are fabricated and preassembled by the manufacturer in Texas.

Operation and Maintenance

The operation would be routinely patrolled, at least three times per week. Routine maintenance would be conducted every three months. A crew of 2 to 5 persons would be required for operation and maintenance of the wind park.

Access Roads

An existing gravel road connecting the site with a paved street would be improved. In addition, 7 miles of surfaced road would need to be constructed to provide access to each of the wind turbine generators. Cross sections showing design specifications are presented in Appendix E.

Transmission Line System

Power generated by each turbine would be transmitted through a 480 volt buried cable to a centrally located 480 v/33 kV transformer. Each transformer would service up to six turbines. Power would be stepped up to 33 kV, and then transmitted on an overhead transmission line which would

parallel the access roads to a substation located on the applicant's adjacent lands. Approximately 2 miles of underground and seven miles of overhead lines would be required. Methods and standards of construction would be similar to that described for U.S. Windpower's application (page 2-17).

CITY OF RIVERSIDE

The City of Riverside, California, Public Utilities Department proposes to construct a total of eight 2.5 megawatt wind turbines on 360 acres of public lands in the San Geronimo Pass (Map 2-5). Development would occur in three phases with the first phase (one machine) beginning in 1983 and concluding in 1985. Phases II (three machines) and III (four machines) would be completed in 1988 and 1989 respectively.

The proposed facility would include turbine installations, several transmission lines to collect power and interconnect into the local power network, the construction of a new substation and control facility, and access roads. An annual output of 69 million kilowatt hours is expected by 1990.

Wind Turbine Generator

The applicant proposes to install eight Boeing MOD-2 turbines. These WTGs have been described in Windfarm's proposal (page 2-1).

Control, Shop and Warehouse Facilities

A control building occupying 180 square feet would be located adjacent to the proposed substation. The building would provide for central monitoring of the WTGs and auxiliary equipment. A fenced storage yard, office, sanitary facilities and parking area would be provided in conjunction with the project. Security guards would be on duty on a 24-hour basis.

A 200-foot meteorological tower and several 10-meter pole anemometers would be installed on site.

Pre-Construction Activities

Wind speed and direction would be determined during the first phase of the project. Wind velocity, direction, and duration would be recorded on instruments mounted on the meteorological tower and pole anemometers. It is not anticipated that final site selection would differ materially from that indicated on the site map. Prior to final determination of site location, engineering surveys and soil tests would be completed.

Construction Activities

Procedures for tower and turbine installation and clean up would be essentially the same as described for Windfarms (page 2-5). Table 2-6 shows the type and degree of land disturbance associated with the project.

Construction Personnel and Equipment

Construction of the proposed wind farm would require a limited work force composed of tradesmen, such as carpenters, cement masons, electricians, welders, ironworkers, millwrights and both technical and common laborers. During assembly and erection of the structure, the average number of workers at the project would be approximately 30. The maximum number of construction personnel at any time would be 40.

Source of Construction Materials

Except for steel and other components used in fabrication of the wind turbine units, it is anticipated that construction materials would be supplied from the Palm Springs area.

Operation and Maintenance (see Windfarm's project description, page 2-9)

Access Roads

The existing access road through Section 34, T.3S., R.3E., S.M.B., would be improved and new road spurs constructed to the proposed tower sites. These roads would be widened to a minimum of 20 feet, including drainage ditches, and graded and resurfaced with gravel to accommodate heavy construction traffic such as motor graders, water trucks, concrete trucks, and heavy-duty cranes.

An estimated 3.5 miles of unimproved dirt road would require upgrading, and 2.3 miles of new gravel road would need to be constructed. Approximately 9 acres would be required for the 20 foot right-of-way. Design specifications are included in Appendix F.

Transmission Line System

During the first two phases of the project, electrical output from the four MOD-2 wind turbine generators would be transmitted through an underground distribution line to the central control building and substation. At the substation, power would be stepped up to 12,470 volts for transmission on an overhead line to Southern California Edison's 12 kV distribution line located approximately one mile to the east of the site.

The installation of four additional machines during Phase III of the project would require rebuilding the 4/12 kV substation to a 4/34 kV installation. The outgoing 12 kV double circuit pole line would be re-insulated, operated at 34 kV and constructed 3 miles to the Whitewater substation.

The service road detail diagram provided by the applicant in Appendix E shows the underground collection system in relationship to the access road. Specifications for the 4 kV underground collection feeders and the 12 kV double circuit overhead line are detailed in Appendix F.

The construction of the 12 kV line would follow a general sequence of surveying, right-of-way clearing, hauling and erection of utility poles, conductor stringing and site restoration. The required 15 foot right-of-way would be cleared only as required to facilitate installation of the poles and conductors.

TABLE 2-6
ENERGY PRODUCTION AND LAND DISTURBANCE ^{1/}
CITY OF RIVERSIDE

	Phase I	Phase II	Phase III	Total
Number of Turbines	1	3	4	8
Type of Turbines	---MOD-2---			
Power Generation (Million kwh)	8.6	25.9	34.5	69.0
Wind Turbine Generators				
Temporary Disturbance Construction Site (acres)	1.2	3.6	4.8	9.6
Maintenance Yards (acres) ^{2/}	0.0	0.0	0.0	0.0
Permanent Disturbance Tower Base (acres)	0.3	0.8	1.0	2.1
Maintenance and Control Building (acres) ^{2/}	0.5	0.0	0.0	0.5
Roads				
New Road (miles) (acres)	0.8 2.9	0.6 2.2	0.9 3.4	2.3 6.5
Upgraded Roads (miles) (acres)	2.1 (2.0) 7.5	0.0 0.0	0.0 0.0	2.1 (2.0) 7.5
Transmission Line System				
34 kV Overhead Lines ^{3/} (miles)	0.4 (2.5)	0.0	0.0	0.4 (2.5)
Temp Disturbance (acres)	0.3	0.0	0.0	0.3
Perm Disturbance (acres)	0.1	0.0	0.0	0.1
Underground Lines (miles)	0.5	0.4	0.8	1.7
Temp Disturbance (acres)	0.5	0.4	0.6	1.5
Perm Disturbance (acres)	0.0	0.0	0.0	0.0
Substations (acres)	0.4	0.0	0.0	0.4
Total Temporary Disturbance (acres)	2.0	4.0	5.4	11.4
Total Permanent Disturbance (acres)	11.6	3.1	4.5	19.2

^{1/} Figures in parentheses are for private lands. All other acreage and mileage figures are for public lands.

^{2/} Figure not provided by applicant. Assumed to be the same as for the Boeing part of the SCE application.

^{3/} Upgraded from 12 kV transmission line.

SMART AND COMPANY

Smart and Company of Hermosa Beach, California proposes to construct a wind turbine generating facility on seventy acres of public land in the San Geronio Pass (see Map 2-5). The proposed facility would consist of twelve 2 megawatt turbines constructed in five phases, with the first phase (one machine) scheduled for completion in 1983. Additional units would follow in 1984, 1985 and 1986. An annual output of 144 million kilowatt-hours would be expected by 1986.

The proposed wind farm would include turbine installation, transmission lines to collect power and interconnect into the local power network, the installation of a new substation and erection of security fencing. No new road construction is anticipated. The WTG being considered for this project is the Merkhham 2000, rated at 2.0 megawatts.

Merkham 2000

Design Characteristics: The Merkhham 2000 is a six-bladed, downwind, induction WTG with a 160-foot rotor mounted on a 100-foot tall tower composed of three 6-foot diameter tubular steel sections and anchored to a 50-foot square concrete base by four tubular steel braces. The total height of the windmill structure is 180 feet with the blade in a vertical position. Each turbine produces 2000 kilowatts of power at its rated wind speed of 30 mph.

The rotor assembly includes six aluminum alloy blades, each 80 feet long, weighing 3000 pounds. The blades are designed to rotate at a constant speed of 36 rpm. They are attached to a steel hub at a cone angle of 5 degrees. At wind speeds greater than 40 mph the turbine can be stopped by either a one man shaft brake or two high speed shaft brakes.

The blade hub is attached to a high-torque, low-speed drive shaft from which rotation is transferred through a high-speed gearbox to an induction generator. The entire assembly is contained in a steel nacelle.

Control Functions: The WTG control system has four major components; free yaw, a back-up application for maneuverability at low speeds, an alternator voltage and phasing control, and circuit breakers for overcurrent control.

Safety Features: The electrical systems have been designed to comply with the National Electrical Safety Code. Lightning protection on all circuits is provided by the grounded steel structure.

Control, Shop and Maintenance Facilities

A control building and shop/warehouse facility would be constructed adjacent to the proposed substation. Construction yard areas would be located on the north and south faces of Windy Point. These would not be required after the turbines are operational. The control building would cover an area of approximately 800 square feet and be fully self-contained.

FIGURE 2-13 Merkham 2000



Security of Facilities and Equipment

Each WTG and all power conditioning equipment would be surrounded by a ten foot security fence with top rail.

Pre-Construction Activities

Land surveys and soil-testing for compaction, moisture, and composition would be conducted prior to construction of WTG facilities.

Construction Activities

Site Preparation

Site preparation would require cutting the peaks and filling the valleys on top of Windy Point. A level area of approximately 75 feet by 2000 feet would be required for locating the wind field. Table 2-7 shows the amount of temporary and permanent site disturbance.

Wind Turbine Installation

Foundation and Underground Conduit Installation: The first stage of installation would encompass site excavation, installation of foundations and trenching of electrical distribution lines to the control-house site. Installation of each tower foundation would involve excavating a 50 foot by 50 foot by 4 foot area. One day would be required for excavation, one day for form construction and set-up, one day to build and place a steel rebar cage for the WTG legs, one day for pouring concrete, and 30 days for the concrete to set. In all, it would require a total of four working days to complete the turbine pad. This work would involve one back-hoe operator, four steel workers, four carpenters, two truck operators and two concrete finishers.

Tower Assembly and Erection: This stage would involve transporting the tower's components to the site, off-loading the components at each foundation site, assembling the tower by welding the tower sections to each of the four support legs. This phase would require three days for each WTG and involve four steel workers, two laborers, and two electricians.

Generator Pad Installation: Generator pad installation would involve transporting the generator to the site and assembling four of the six blades on the ground.

Blade Mounting: Once the generator and four blades have been installed and hoisted into place, the remaining two bottom blades would be attached using a 90-ton crane. This phase would require both manufacturer representatives and two steel workers four hours to accomplish.

Construction Personnel and Equipment

During construction of the first phase, the average number of workers at the project location would be approximately 15. Some of the workers would be drawn from the local labor force and the remainder would be provided by the construction contractor.

TABLE 2-7

ENERGY PRODUCTION AND LAND DISTURBANCE ^{1/}

SMART AND COMPANY

Number of Turbines	12
Type of Turbines	Merkham 2000
Power Generation (Million kWh)	144.0
Wind Turbine Generators	
Temporary Disturbance	
Construction Site (acres)	20.0
Maintenance Yards (acres)	0.5
Permanent Disturbance	
Tower Base (acres)	0.6
Transformer Pad (acres)	0.0
Maintenance and Control Building (acres)	0.1
Roads	
New Road (miles)	1.1
(acres)	4.0
Transmission Line System	
33 kV Overhead Lines (miles)	0.2 (4.2)
Temp Disturbance (acres)	0.1
Perm Disturbance (acres)	0.1
Substations (acres)	0.1
Total Temporary Disturbance (acres)	20.5
Total Permanent Disturbance (acres)	4.6

^{1/} Figures in parentheses are for private lands. All other acreage and mileage figures are for public lands.

One 90-ton crane, 150-foot boom, tractor, back-hoe, several tractor trailers for delivery of the WTGs and components, two trucks, water tank, diesel tank, one AC/DC generator, and a 150-foot cherry picker would be required for site preparation and wind turbine installation.

Temporary Use Areas

Approximately 20 of the 70 acres initially required to develop and maintain the wind turbine generators would be temporarily occupied. Five acres would be required for permanent occupancy.

Operation and Maintenance

A service contract with the manufacturer would be in force.

Access Roads

An existing road up to Windy Point would provide main access to the site. An estimated 1.1 miles of secondary spur roads would be required to provide access between each of the WTGs.

Transmission Line System

Less than one mile of overhead transmission line would be constructed on public land to interconnect the wind turbine generators during Phase III of the project. Approximately 0.1 acres would be within the 50-foot right-of-way.

Tubular steel tangent poles would be used for the overhead transmission line. Design characteristics of the transmission line and towers are included in Appendix E.

Transmission line construction would follow a sequence of right-of-way clearing; tower foundation construction; hauling, assembly, and erection of poles; conductor and shield wire stringing; and site restoration.

NATOMAS ENERGY COMPANY

Natomas Energy Company, an operating subsidiary of Natomas Company, plans to design and construct a wind energy park under a joint agreement with Southern Pacific Land Company on lands owned by the latter in Section 13, Township 3 South, Range 3 East, SBM. Natomas Energy Company has submitted an application to the BLM for wind access rights on approximately 775 acres of public lands located adjacent to their private land holdings. The lands applied for include: 325 acres in Section 2, T.3S., R.3E., 160 acres in Section 14, T.3S., R.3E.; and 290 acres in Section 24, T.3S R.3E, SBM.

ALTERNATIVE 2: DEVELOPMENT ON LANDS EXCEPT THOSE WITH SIGNIFICANT SURFACE CONFLICTS

Wind energy development would be allowed only on designated parcels of public land. The boundaries and development restrictions applied to each of these parcels are based on the application of site-specific mitigation measures (Chapter 4) and generic mitigation proposed in the joint BLM and

County of Riverside San Geronio Wind Resource Study EIR/EIS (March 1982). These mitigating measures would reduce adverse impacts to visual resources, wind access, communications, fragile slopes, wildlife and scenic highways.

Two types of parcels have been identified: (1) Non-Competitive: Areas where turbines would be allowed and where only one applicant has applied; and (2) Competitive: Areas where turbines would be allowed and where two or more applications have been filed (overlapping applications).

Where competition exists, a modified-competitive bid procedure (Chapter 1) would be used to decide which applicant would be allowed to develop within each parcel. Table 2-8 presents a summary of the constraints which would apply to each parcel and the amount of power which could be generated by each applicant. More detailed information regarding the type and degree of constraints is available in the mitigations section of Chapter Four (page 4-58). Parcel boundaries and types are identified on Map 2-6 (Map Folder).

ALTERNATIVE 3: NO ACTION

Under this alternative, no wind energy development would be permitted on public lands within the study area.

Most public land falls within the California Desert Conservation Area and would continue to be managed under the guidelines of the California Desert Plan (BLM, 1980). Management of the area would be as described on page III-4 through III-7 in the San Geronio Wind Resource Study EIR/EIS (March, 1982).

AUTHORIZING ACTIONS

ACTIONS REQUIRED TO AUTHORIZE PROPOSED PROJECTS

Permits for wind energy conversion systems within the study area fall under three major permitting authorities. The BLM has permitting authority over federally managed lands. The California Public Utilities Commission (CPUC) must consider certification of any privately owned facility for which its jurisdiction is not preempted by the Public Utility Regulatory Policies Act and for which in aggregate, a net capacity available at the busbar will be in excess of 50 megawatts. Riverside County has permitting authority over any facility on private land over which the California Public Utilities Commission does not have jurisdiction (with the possible exception of wind development by public utilities).

The permitting process for wind turbine development on public lands property will conform to the Federal Land Policy and Management Act (FLPMA) and BLM circular #2468 (43 CFR Part 2800). If BLM approves and grants a right-of-way, detailed negotiations will be conducted between BLM and the applicants to review and modify, as necessary, the final location of the above facilities on public lands.

Table 2-8

ALTERNATIVE TWO
SUMMARY OF PARCEL CONSTRAINTS

Parcel	Parcel Type	Constraints Applied in Determining Boundaries
Cabazon (15 acres $\frac{1}{2}$)	Non-Competitive	Development rights would be granted to Pan-Aero (sole applicant) with the following constraints: - One-third mile visual setback from I-10 (the 1/2 mile setback normally required is waived due to high wind potential) - Wind access setbacks
North Whitewater (315 acres)	Competitive	- 25 percent slope restrictions - Microwave beam CD-EE (no large turbines would be permitted along the beam path except between 700 and 2300 feet from microwave transmitting site EE) - Microwave beams FF-EE and EE-GG (no large turbines) - Wind access setbacks
North Whitewater (35 acres $\frac{1}{2}$)	Non-Competitive	Development rights on ridges in Sections 28 and 33 would be granted to PanAero (sole applicant) with the following constraints: -25 percent slopes -Large machines only (visual constraint)
	Non-Competitive	Development rights would be granted to U. S. Windpower (sole small-turbine applicant) with the following constraints: -25 percent slopes -Wind access setbacks
Alta Mesa (50 acres)	Competitive	- 25 percent slope restrictions - Additional WRM setback along southwest boundary of the top of the Mesa, including relocation of one Windfarms turbine - Wind access setbacks
(50 acres)	Non-Competitive	Development rights on the lower slopes of Alta Mesa would be granted to U. S. Windpower (sole applicant) with the following restrictions: - 25 percent slopes - Wind access setbacks
(20 acres)	Non-Competitive	Development rights would be granted to Windfarms (sole applicant) with the following restrictions: - 25 percent slopes
Whitewater Hill (65 acres)	Competitive	- Area south of the east-west road leading to the summit of Whitewater would be eliminated due to visual setbacks (Because to the presence of high, steep hillsides next to I-10, the normal scenic highway setback--which would have been more restrictive--was not felt necessary) - Turbine on top of the Hill just south of the microwave transmitter would be eliminated due to interference with several beams - No turbines would be located within 0.4 miles of the microwave transmitter on the top of the Hill along beam path N-P - Remaining large turbines would be eliminated by visual mitigations (on Whitewater Hill) and wind access setbacks

Table 2-8

ALTERNATIVE TWO
SUMMARY OF PARCEL CONSTRAINTS

(continued)

Parcel	Parcel Type	Constraints Applied in Determining Boundaries
Whitewater Floodplain 14 (100 acres)	Competitive	Development would be restricted to small turbines only with the following constraints: - Wind access setbacks - Scenic highway setbacks - Microwave interference (beam B-E) - 1-1/4 blade diameter setback from the Pacific Crest Trail
Whitewater Floodplain 20/28 (585 acres)	Competitive	- Wind access setbacks - Scenic highway setbacks - Visual mitigations (section quartering) - Microwave interference (beam E-D) - Whitewater settling ponds--no development in western 1/4 of Section 20 (wildlife)
Whitewater Floodplain 22 (175 acres)	Competitive	- Wind access setbacks - Scenic highway setbacks - Visual mitigations (section quartering) - Microwave interference (beam E-D and M-L)
Edom Hill (65 acres ^{1/})	Non-Competitive	Development rights would be granted to PanAero (sole applicant) with the following restrictions: - Wind access setbacks - 25 percent slopes - Elimination of turbines south of the Edom Hill-Flat Top Mountain crest (visual mitigation) - Limit siting of turbines near Willow Hole to four medium size turbines
No Development Areas	---	No development would be permitted south of Painted Hill due to: - Wind access setbacks - 1 1/4 blade diameter setback from the Pacific Crest Trail No development would be permitted in Devils Garden due to: - 25 percent slopes - Specific visual mitigations eliminating turbines - 1 1/4 blade diameter setback from anticipated route of Pacific Crest Trail (if the PCT is built along this ridge) No development would be permitted at Windy Point due to: - 25 percent slopes - Scenic highway setbacks - Specific visual mitigation to protect an important landmark

^{1/} The acreage available for the PanAero array is based on a 200 foot right-of-way width.

TABLE 2-9

ENERGY PRODUCTION AND LAND DISTURBANCE 1/

WINDFARMS

	N. Whitewater	Section 20/28	Section 22	Alta Mesa		Total
Parcel Type				Non-Comp.	Comp.	
Number of of Turbines	7 (9)3/	11	2	1	3	24 (9)
Type of Turbines			---MOD-2/WTS-4---			
Power Generation (Million kwh)	117.6	135.8	21.4	10.7	50.4	335.6
Wind Turbine Generators						
Temporary Disturbance Construction Site (acres)	8.4	13.2	2.4	1.2	3.6	28.8
Maintenance Yards (acres) 2/	0.0	0.0	0.0	0.0	0.0	0.0
Permanent Disturbance Tower Base (acres)	2.3	2.8	0.5	0.2	0.7	6.5
Transformer Pad (acres)	0.3	0.4	0.1	0.0	0.1	0.9
Maintenance and Control Building (acres) 2/	0.0	0.0	0.0	0.0	0.0	0.0
Roads						
New Road (miles)	0.8(1.1)	3.2(0.2)	0.6 (0.1)	0.0	0.8 (1.0)	5.4 (2.4)
(acres)	2.9	11.7	2.2	0.0	2.7	19.5
Upgraded Roads (miles)	0.7(0.9)	0.9(2.3)	0.9 (0.3)	0.0	0.2 (0.6)	2.7 (4.1)
(acres)	2.6	3.3	3.3	0.0	0.6	9.8
Transmission Line System						
Underground Lines (miles)	1.9(3.6)	5.9(0.9)	1.5 (0.7)	0.1	1.0 (3.7)	10.4 (0.9)
Temporary Disturbance (acres) (when not following road)	0.3	0.0	0.3	0.0	0.0	0.7
Substations (acres)	0.0	0.0	0.0	0.0	0.0	0.0
Total Temporary Disturbance (acres)	14.2	28.2	8.2	1.2	6.9	58.7
Total Permanent Disturbance (acres)	8.1	18.2	6.1	0.2	4.1	36.7

1/ Figures in parentheses are for private lands. All other acreage and mileage figures are for public lands.

2/ Site undetermined.

3/ Assumes development on private lands owned by Windfarms adjacent to Alta Mesa and North Whitewater

TABLE 2-10

Energy Production and Land Disturbance ^{1/}

U. S. WINDPOWER

	North Whitewater		Alta Mesa		Whitewater Hill		Whitewater Floodplain 14	Whitewater Floodplain 20/28	Whitewater Floodplain 22	Total
Parcel Type	Competitive Non-Comp.		Competitive Non-Comp.		Competitive		Competitive	Competitive	Competitive	
Number of of Turbines	275	36	57	44	26	79	433		172	1,122
Type of Turbines	-----USM 56-50-----									
Power Generation (Million kwh)	55.0	7.2	11.4	8.8	5.2	13.4	73.6		29.2	203.8
Wind Turbine Generators										
Temporary Disturbance Construction Site (acres)	12.6	1.7	2.6	2.0	1.2	3.6	19.9		7.9	51.5
Maintenance Yards (acres) ^{2/}	0.1	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.1
Permanent Disturbance Tower Base (acres)	1.4	0.2	0.3	0.2	0.1	0.4	2.2		0.9	5.7
Maintenance and Control Building (acres) ^{2/}	1.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	1.0
Roads										
New Road (miles)	7.6	0.8	2.0	0.6	0.8	1.7 (1.0)	10.2 (0.1)		4.7	28.4
(acres)	10.9	1.1	2.9	0.9	1.2	1.2	14.8		6.9	39.9
Upgraded Roads (miles)	2.3	0.9	0.0	0.0	0.0	0.0	0.0		0.0	3.2
(acres)	3.4	1.4	0.0	0.0	0.0	0.0	0.0		0.0	4.8
Transmission Line System										
12 kV Overhead Lines (miles) ^{3/}	0.5 (1.4)	0.5 (1.4)	0.0 (1.9)	0.0 (1.9)	0.2 (1.2)	0.0 (1.0)	0.0 (0.5)		0.0 (0.5)	1.2 (9.8)
Temp Disturbance (acres)	0.1	0.1	0.0	0.1	0.1	0.0	0.0		0.0	0.2
Perm Disturbance (acres)	0.1	0.1	0.0	0.0	0.1	0.0	0.0		0.0	0.1
Underground (miles)	9.5	3.4	3.6	1.2	1.1	1.7	10.2 (0.1)		10.2 (0.1)	40.9
Substations (acres)	0.0	0.0	0.0	0.4	0.0	0.4	0.4 ^{4/}		0.4 ^{4/}	1.2
Total Temporary Disturbance (acres)	28.1	4.3	5.5	3.3	2.4	5.2	35.1 ^{4/}		15.2 ^{4/}	98.7
Total Permanent Disturbance (acres)	16.7	2.7	3.2	1.8	1.3	2.0	17.4		8.2	52.6

^{1/} Figures in parentheses are for private lands. All other acreage and mileage figures are for public lands.

^{2/} Site undetermined.

^{3/} It is assumed that Riverside County would issue U.S. Windpower a permit to construct an overhead 12 kV transmission line across private lands. Overhead 12 kV transmission lines which would be located within an existing ROW would be permitted over public lands.

^{4/} Development in Sections 20, 22 and 28 would require one substation.

TABLE 2-11

ENERGY PRODUCTION AND LAND DISTURBANCE^{1/}
SOUTHERN CALIFORNIA EDISON^{2/}

	Whitewater Hill	Whitewater Floodplain 20/28	Whitewater Floodplain 22	Total
Parcel Type	Competitive	Competitive	Competitive	
Number of Turbines	13	114	11	138
Type of Turbines	WECS Tech	Ventus	Westinghouse	
Power Generation (million kwh)	1.7	47.7	14.7	64.1
Wind Turbine Generators				
Temporary Disturbance Construction Site (acres)	0.8	3.1	1.7	5.6
Maintenance Yards (acres) ^{3/}	1.0	1.0	1.0	3.0
Permanent Disturbance				
Tower Base (acres)	0.1	0.1	0.2	0.4
Transformer Pad (acres)	0.0	0.0	0.0	0.0
Maintenance and Control Building (acres) ^{3/}	0.1	0.2	0.1	0.4
Roads				
New Road (miles) (acres)	0.3 (0.9)	6.8 (20.4)	2.3 (6.8)	9.4 (28.1)
Upgraded Roads (miles) (acres)	0.0	2.2 (6.6)	0.3 (0.7)	2.5 (0.7)
Transmission Line System				
Underground Lines (miles)	1.0(1.2)	6.8(1.7)	2.5(0.5)	10.3(3.4)
Substations (acres)	0.1	0.1	0.1	0.3
Total Temporary Disturbance (acres)	2.0	31.4	10.6	44.9
Total Permanent Disturbance (acres)	1.2	27.4	8.1	36.7

- ^{1/} Figures in parentheses are for private lands. All other acreage and mileage figures are for public lands.
^{2/} Boiling has applied through Southern California Edison for a right-of-way in Section 14, T.35., R.3E. Development would be restricted to small wind turbine generators only.
^{3/} Site undetermined.

TABLE 2-12
Energy Production and Land Disturbance ^{1/}
PANAERO ^{2/}

	Cabazon	Alta Mesa		North Whitewater	Whitewater Floodplain 20/28	Whitewater Floodplain 22	Edom Hill	Total
Parcel Type	Competitive	Competitive	Non-Competitive	Competitive	Competitive	Competitive	Non-Competitive	
Number of Turbines	12 medium	1 large 2 medium	6 large	3 large 6 medium	11 large 39 medium	2 large 8 medium	5 large 35 medium	28 large 102 medium
Type of Turbines	---DAF Indal/WMG-0500/WTS-40-----							
Power Generation (Million kwh)	26.4	22.0	105.6	66.0	279.4	52.8	165.0	717.2
Wind Turbine Generators								
Temp Disturbance Construction Site (acres)	1.8	0.6	4.1	2.1	8.6	1.7	6.5	25.4
Maintenance Yards ^{3/} (acres)	1.5	-----	1.5-----		-----1.5-----		1.5	6.0
Perm Disturbance Tower Base (acres)	0.6	0.2	1.4	0.7	2.9	0.6	2.2	8.6
Maintenance and Control Building (acres) ^{3/}	0.1	-----	0.1-----		-----1.0-----		0.4	0.7
Roads								
New Road (miles) (acres)	1.9 (0.2) 6.9	0.6 2.3	2.3 8.5	1.6 5.6	5.5 19.9	5.8 1.6	3.8 (0.2) 13.7	21.5 58.5
Upgraded Roads (miles) (acres)	0.0 0.0	0.1 (0.6) 0.4	0.8 (0.6) 2.9	1.6 (0.6) 5.8	0.0 0.0	0.0 0.0	0.0 0.0	2.5 9.1
Transmission Line System								
Underground	1.9 (0.4)	0.8 (0.2)	3.9 (0.2)	3.7 (0.2)	5.5 (0.2)	0.9 (0.4)	14.0 (7.5)	30.7
Substations (acres)	0.1		0.1	0.1		0.1	0.1	0.4
Total Temporary Disturbance (acres)	10.3	3.3	15.5	15.2	28.5	5.0	22.2	100.0
Total Permanent Disturbance (acres)	7.6	2.9	12.8	12.3	22.8	2.4	16.4	77.2

^{1/} Figures in parentheses are for private lands. All other acreage and mileage figures are for public lands.

^{2/} PanAero has applied for a right-of-way in Section 14, T.3S., R.3E. Development would be restricted to small wind turbine generators only.

^{3/} Site undetermined.

TABLE 2-13
ENERGY PRODUCTION AND LAND DISTURBANCE 1/
SAN GORGONIO FARMS

	Whitewater Hill		Total
Parcel Type	Competitive		
Number of Turbines	18	16	34
Type of Turbines	CWG-25	CWG-125	
Power Generation (Million kwh)	1.5	6.9	8.4
Wind Turbine Generators			
Temp Disturbance Construction Site (acres)	0.5	D.4	0.9
Maintenance Yards (acres)	0.0	D.0	0.0
Perm Disturbance Tower Base (acres)	0.1	D.1	0.2
Maintenance and Control Building (acres) <u>2/</u>	D.0	D.0	D.0
Roads			
New Roads (miles)	1.5	(0.9)	1.5
(acres)	5.5		5.5
Transmission Line System			
12 kV Overhead Lines (miles)	5.5		5.5
Temp Disturbance (acres)	D.1		0.1
Perm Disturbance (acres)	D.1		D.1
Underground Lines (miles)	2.3	(D.9)	2.3
Substations (acres)	0.0		D.0
Total Temporary Disturbance (acres)	6.5		6.5
Total Permanent Disturbance (acres)	5.7		5.8

1/ Figures in parentheses are for private lands. All other acreage and mileage figures are for public lands.

2/ Figure not provided by applicant. Assumed to be the same as for the Boeing part of the SCE application.

TABLE 2-14

ENERGY PRODUCTION AND LAND DISTURBANCE ^{1/}

CITY OF RIVERSIDE

	North Whitewater
Number of Turbines	7
Type of Turbines	MOD-2
Power Generation (Million kwh)	60.4
Wind Turbine Generators	
Temporary Disturbance	
Construction Site (acres)	8.4
Maintenance Yards (acres) ^{2/}	0.0
Permanent Disturbance	
Tower Base (acres)	1.9
Maintenance and Control Building (acres) ^{2/}	0.5
Roads	
New Road (miles)	2.1
(acres)	7.6
Upgraded Roads (miles)	2.1 (2.0)
(acres)	7.5
Transmission Line System	
34 kV Overhead Lines (miles)	0.4 (2.5)
Temporary Disturbance (acres)	0.1
Permanent Disturbance (acres)	0.1
Underground Lines (miles)	2.1
Temporary Disturbance (acres)	1.7
Permanent Disturbance (acres)	0.0
Substations (acres)	0.4
Total Temporary Disturbance (acres)	26.4
Total Permanent Disturbance (acres)	18.0

^{1/} Figures in parentheses are for private lands. All other acreage and mileage figures are for public lands.

To implement the project as proposed, authorizing actions would be required by the following Federal agencies:

Army Corp of Engineers: Issues individual 404 permits for stream crossing and construction of diversion structures in the Whitewater Floodplain.

Federal Communications Commission (FCC): Grants licenses to operate microwave communication systems.

Federal Aviation Administration (FAA): Grants approval for obstructions greater than 200 feet above ground level or adjacent to City of Palm Springs airport.

Federal Energy Regulatory Commission (FERC): Regulates the interconnection of electric transmission facilities.

The CPUC and the California Energy Commission (CEC) are cooperating agencies with BLM under the provisions of the Council of Environmental Quality Regulations and have signed Memorandum of Understanding statements with BLM. The CEC has agreed to assist the BLM in project specific analysis and provide technical assistance and review for the regional analysis.

The CPUC has agreed to participate in the determination of the scope of environmental studies. The agency also agreed to assist in the project specific analysis of utility and interconnector requirements, within staffing and budget limitations. Technical assistance was provided by CPUC for review of wind ownership alternatives, pricing, arrangements, electricity price impacts of utility owned wind installation and utility system and interconnection requirements for the regional analysis.

Another State agency which must also be involved is the California Department of Transportation (CALTRANS). CALTRANS grants encroachment permits for transmission lines crossing state and interstate highways and is responsible for the issuance of highway use permits (for oversize or overweight vehicles using public roads during construction).

Additional review and/or approval on non-federal lands is necessary from Riverside County.

STANDARD OPERATING PROCEDURES AND MITIGATING MEASURES

Certain standard operating procedures and mitigating measures developed by BLM and Riverside County during preparation of the San Geronio Wind Resource Study EIR/EIS will be required by BLM as a condition to receipt of approval to utilize public lands. These procedures and measures are designed to minimize the general impacts of construction and operation activities associated with implementation of any one, or parts of the alternatives described in Chapter 2 of this EIS (excluding the no action alternative). A list of the standard operating procedures is provided in Appendix J. Mitigating measures designed to avoid or minimize impacts specific to an alternative which conflict or are in addition to the general provisions described in the generic EIR/EIS are included in Chapter 4 (MITIGATION).

COMPARATIVE ANALYSIS OF ALTERNATIVES

Table 2-15 presents a cumulative summary of the impacts of major concerns which would result with the implementation of the alternatives, including the proposed action.

IDENTIFICATION OF THE BUREAU OF LAND MANAGEMENT PREFERRED ALTERNATIVE

Alternative 2 is the Bureau of Land Management preferred alternative. This alternative would allow competitive and non-competitive right-of-way grants on public lands in the San Geronio Pass for the development of wind energy resources and electrical power generation.

The issuance of grants to proceed would be consistent with the principals and procedures of 43 CFR Part 2800 (pursuant to the Federal Land Policy and Management Act of 1976) which provides for (1) orderly and timely resource development, (2) protection of the environment, and (3) receipt of fair market value for disposition of the public resources. Development would be consistent with the G-E-M objective in the California Desert Plan by providing access and availability to public lands for the exploration, production, and utilization of its energy resources.

Under Alternative 2, development would be allowed to proceed on a majority of the applications received by the Bureau. Most of the applicants would be eligible to develop their projects within the Pass, subject to the results of the modified-competitive bid process. Therefore, a variety of approaches encompassing a number of wind turbine technologies for utilizing the area's wind resources would be provided. In addition, the alternative's development restrictions would help protect the Pass's unique and sensitive resources, including its visual landmarks, recreation opportunities and wildlife. Wind development would also be regulated to prevent interference with communication facilities and adequate measures would be provided to avoid or minimize hazards to the public health and safety.

The preferred alternative is not the final decision on the project, but only the BLM's preference based on information presented in this EIS. A final decision regarding which alternative to adopt can not be made until 30 days after publication of the final EIS. The disposition of the competitive grant parcels will be determined by modified-competitive bid following the final decision.

TABLE 2-15
IMPACT COMPARISON SUMMARY

ISSUES	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Aesthetic Values	Moderate to strong visual impacts exceeding contrast/dominance objectives in North Whitewater Canyon, Whitewater Hill and Devils Garden. Portions of these areas would be highly visible to travelers along Interstate 10, Route 62, Palm Springs, and Desert Hot Springs. Line and color contrasts would result from development on steep slopes (over 25 percent) along the southern slopes of Alta Mesa, North Whitewater Canyon, Devils Garden, Windy Point and Whitewater Hill. Density of machines would create strong contrasts in the "wash" and Whitewater Hill areas. Visual objectives would not be met in floodplain areas due to the solid mass of turbines, which when viewed from residential areas and Interstate 10, would result in a strong "clutter" effect. Density and mixture of machine types would result in moderate to strong impacts on the landscape. Use of overhead transmission lines would create significant vertical and color contrast.	WTGs would remain a distinct element in the landscape. Design clusters would reduce the visual dominance of towers. Highway setbacks and development restrictions on slopes over 25 percent would reduce line, color, and "clutter" contrasts to a moderate level and meet the visual objectives for the area. Development in the floodplain would remain highly visible. Visual contrast/dominance would not, however, impair visual quality. Contrast levels would be moderate/co-dominate. Use of single WTG types and undergrounding of transmission lines would prevent "clutter" and disorder of mixed arrays in North Whitewater, Alta Mesa and Cabazon.	Retention of major visual features (i.e. mountain slopes and Whitewater Canyon) with gradual fragmentation of the valley floor as a visual unit with scattered, low-density residential development. The overall effect would be significantly less severe than with wind development.

TABLE 2-15
IMPACT COMPARISON SUMMARY
(continued)

ISSUES	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Safety	Low to moderate potential for tower failure and/or blade throw. Ease of access to WTGs could lead to vandalism. Some interference with other land uses such as highways, flood improvements, railroads, etc.	Setback requirements from public roads, buildings, utility lines and other land uses would provide a buffer zone in the event of machine collapse or blade throw. Potential safety hazard would be low.	No impact.
Noise	General operational noise may be a problem for the community of Bonnie Bell from development of large turbines north of Alta Mesa and in the Whitewater floodplain. "Thumping" sound may result where downwind turbines are sited.	Development would meet County and Federal standards. "Thumping" sound would not present a noise problem.	Maintain current levels. Meet local and Federal standards.
Electromagnetic Interference	Turbines would interfere with microwave transmission in the area north of Alta Mesa, on Whitewater Hill and in the Whitewater Floodplain. Potential interference to television reception. Some interference to two-way radio communication. No impact on VORTAC signals is anticipated.	Microwave interference would be eliminated. Television visual distortion would be minimal. Other impacts would be the same as Alternative 1.	No impact.

TABLE 2-15
IMPACT COMPARISON SUMMARY
(continued)

ISSUES	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Ecology	Potential exists for low incident rates of collisions between birds, WTGs, and overhead transmission lines. High impacts on migrating birds and waterfowl using the Whitewater Settling Ponds. Birds using updrafts along the east rim of Whitewater Canyon would come into contact with the blades of large turbines. Hazard of raptor electrocutions from overhead transmission lines. Surface disturbance due to construction of WTGs in the Whitewater floodplain would directly impact from 53 to 120 acres of habitat used by the Coachella Valley Fringe-toed lizard--federally listed as threatened and state listed as endangered. The effects of large turbine arrays on sand transport and deposition is unknown. Noise from large wind turbines would adversely impact lizard populations. The presence of turbines may force bighorn sheep to retreat a distance of one mile from the nearest WTGs, affecting 6 to 8 square miles of habitat in North Whitewater Canyon. From 2 to 2 1/2 square miles of habitat utilized by Peninsular bighorn sheep would be adversely impacted near Windy Point.	Potential collisions between birds and WTGs would be the same as Alternative 1. Low impact on migratory birds using the Whitewater Settling Ponds. Siting of large turbines along the east rim of Whitewater Canyon would be deferred until studies are completed in the fall of 1982. Potential for raptor electrocutions would be eliminated. Construction would result in 36 to 50 acres of surface distance to CVFTL habitat. 3 to 4 square miles of bighorn sheep habitat would be disturbed in Whitewater Canyon. No Peninsular sheep would be impacted.	Slight impact due to continued use of off-road-vehicles and recreation use. Disturbance to CVFTL habitat would continue with GRV use. No impact.

TABLE 2-15
IMPACT COMPARISON SUMMARY
(continued)

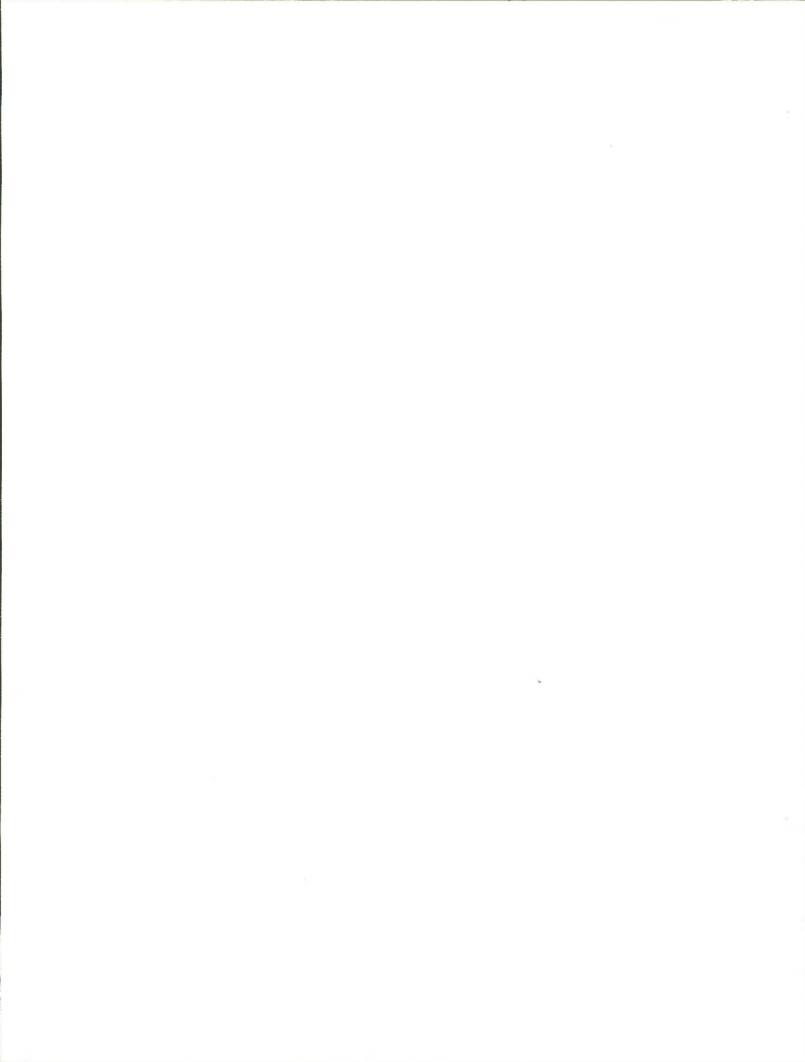
ISSUES	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Land Use	Recreational experience on 3 miles of the Pacific Crest Trail would be altered in Devils Garden, lower Whitewater Canyon and portions of the floodplain north of Windy Point. Locating WTGs in alternating sections of public lands in the Whitewater floodplain would change recreational land use patterns for ORV enthusiasts, sunbathers, etc.). Up to 1,300 acres presently viewed as "open space" would be eliminated. Access would generally be maintained between rows of turbines. Development would not preclude the inclusion of public lands into the Whitewater Regional Park, although the quality of recreational experience would be less. Construction would preclude 200 acres within the Whitewater Wilderness Study Area (presently recommended as non-suitable) from future wilderness designation. Development may significantly impact Native American values in Whitewater Canyon and Devils Garden.	Less than 1 mile of the PCT would be impacted by WTG development. Safety hazards would be minimal. Similar to Alternative 1 expect 40 to 60 percent of the area would remain undeveloped. Setbacks would provide a minimum 500 foot corridor for recreationists. Same as Alternative 1. Values in Devils Garden would be preserved.	Trail users would not experience the unique sights of wind energy development. No impact. Preserve the option of adding public lands to the National wilderness system.

TABLE 2-15
IMPACT COMPARISON SUMMARY
(continued)

ISSUES	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Wind Access and Equity	Issue of equity and resource allocation would remain unresolved.	Restriction of access and allocation would provide an equitable solution through setbacks from property lines adjoining public lands.	Not applicable.
Social and Economic	Impacts on employment, housing and tourism would not be significant. Property tax revenues would exceed \$9 million per year.	Same as Alternative 1. Property tax revenues would range from \$2.7 to \$4.4 million.	No property tax revenues would be passed to the State.
Geotechnical and Soils	Road and WTC construction would destroy the desert crust and erosion pavement rendering the exposed soil surface vulnerable to accelerated wind erosion.	Same as Alternative 1 except that the total number of miles of new road would be reduced approximately 20 percent.	No additional road construction. Soil erosion would be low to moderate with continual use of public lands by ORVs.
Hydrological Conditions and Floodplains	Loss of pervious land surface in the White-water floodplain would decrease infiltration adding to surface runoff.	Less impacting than Alternative 1 due to a 40 to 60 percent reduction in areas subject to wind development.	No impact.
Power Output and Electrical Generation	From 18 to 390 MW of installed capacity would be produced generating 60 to 1,200 million kwh per year.	From 123 to 181 MW of installed capacity would be produced generating a maximum of 850 million kwh per year.	The wind energy resource would not be developed and other power sources such as coal and oil would be needed to meet future energy demands.

CHAPTER 3

AFFECTED ENVIRONMENT



CHAPTER 3

AFFECTED ENVIRONMENT

INTRODUCTION

This chapter describes the environment of the areas that would be affected through the implementation of any of the alternatives described in Chapter 2. Impacts upon certain environmental elements (Chapter 1) were not found of sufficient significance to be analyzed in detail. Those environmental elements which would sustain more significant impacts or are major issues as determined through the scoping process are described below.

ENVIRONMENTAL ELEMENTS

LAND USE

RECREATION

Public lands in the study area offer a wide variety of recreational activities (Map 3-1). Use centers on two major areas: the Whitewater River floodplain northwest of Palm Springs, and Whitewater River Canyon. Popular recreation activities include hiking, nature study, education and research, picnicking, floral observation, sightseeing, oriving for pleasure, sunbathing, ORV-use, and water-oriented activities when the river is flowing.

Whitewater Canyon is the only concentrated use zone in the study area; use of the 12.6 square mile zone has been estimated at approximately 1300 visitor use days annually (BLM aerial visitor use counts, 1978), a figure which is probably too low. Most of the canyon's drainage is within the Whitewater Canyon ACEC, a 12,145 acre area established by the California Desert Plan to protect the watershed and preserve wildlife habitat and Native American Values. Management prescriptions incline towards a general increase in recreation opportunities in the canyon, including development of an interpretive trail, designation of approved vehicular use roads, and construction of a campground.

The Pacific Crest Trail route has been surveyed throughout most of the study area (the "Whitewater" segment of the PCT); an existing trail follows much of the surveyed route. Most of the trail within the study area has been classified experience level IV (trail passing through areas where a managed landscape predominates, with little opportunity for a feeling of remoteness); north of Bonnie Bell the trail has been classified as the somewhat more natural Class III. No motorized vehicle use of the trail is permitted. A 30-foot easement (15 feet on either side of the trail centerline) would be provided for the trail. Use levels are unknown.

The City of Palm Springs has proposed establishing a Whitewater Regional Park which would include land within the Whitewater River floodplain northwest of the city and between Highways 111 and I-10, and also the bottom of Whitewater Canyon as far north as the Whitewater Trout Farm. The canyon portion of the park would be left in a relatively natural state, emphasizing the ACEC, PCT, and wildlife. That portion between the

highways would be managed for improved support of the current heavy utilization of that area by sunbathers, off-road vehicles (particularly ATCs near Windy Point) and water-oriented activities by improving access and parking facilities.

Off-road vehicle use also occurs in the hilly country between and north of Edom Hill and Flat Top Mountain. Although not officially an ORV play-area, the rolling terrain is liberally criss-crossed with roads and ORV trails. Use levels are unknown.

WILDERNESS

One wilderness study area, the Whitewater, lies within the study area (see Map 3-1). Of the area's 14,220 acres of public land, 11,070 (78 percent) have been recommended as suitable for inclusion in the Natural Wilderness Preservation System. The area, which lies on the southeastern tip of the San Bernardino Mountains between the San Bernardino National Forest and the San Geronio Pass, contains a diversity of topography, vegetation and wildlife due to elevations ranging from 2300 to 5500 feet. That portion recommended as suitable was so proposed due to its wilderness qualities, proximity to urban areas, high potential for primitive recreation use, and location next to the designated San Geronio Wilderness area. No wind development would be permitted. The 3,150 acres recommended as non-suitable would be managed as Class L under the BLM's California Desert Plan. This class permits wind development; however, any development must wait until Congress makes its final decision regarding wilderness on these lands. Management under Class L would be for low intensity use.

LIVESTOCK GRAZING

Most of the public lands north of Interstate 10 are within the Whitewater Canyon Grazing Allotment. This is a perennial-ephemeral allotment with a low level of livestock use (768 animal unit months) on 26,878 acres of good-condition rangeland.

MINING

No large-scale mineral extraction activities occur on public lands within the Study Area.

VISUAL RESOURCES

GENERAL ENVIRONMENT

The study area is located at the interface between the upland California Chaparral and lowland American Desert provinces. Vegetation is generally low, scattered and sparse within the landscape dominated by mountains surrounding an expansive out-wash plain. There are several natural landmarks which include the San Janito Mountains, Alta Mesa, Painted Hills, Whitewater Canyon, Whitewater Hill, Windy Point, Garnet Hill, Flat Top Mountain, Edom Hills and the blow sands of the Whitewater Floodplain.

The study area can be divided into four major visual areas: San Geronio Pass, Whitewater Canyon, Upper Coachella Valley and the Lower Coachella Valley (Map 3-2).

The San Gorgonio Pass, is a narrow, two mile wide, seven mile long corridor framed by San Jacinto Peak on the south and the San Bernardino Mountains on the north. The valley is relatively flat, rising gently towards alluvial fans and rolling terrain. The San Gorgonio and White Water River washes are whitish-gray expanses of gravel and sand while the remainder of the area is beige to gray soil with a mosaic pattern of low vegetation. The area is traversed by Interstate 10 and Route 111, the railroad and numerous utility lines. It also contains scattered commercial and residential buildings and a series of large billboards near Cabazon.

The valley slopes dominate the area. The southern side rises steeply to the rugged ridgeline of San Jacinto Peak. The lower slopes are deeply dissected and form distinct ridges, pale brown in color and dotted with vegetation.

The northern valley sides also rise abruptly and are dissected by small ravines, reddish-gray in color. Alta Mesa, a flat-topped plateau forms the northeastern boundary of the area. The eastern end of the pass is demarked by two landmarks, Windy Point and Whitewater Hill. The Bureau rates the valley sides a scenic quality Class A and the valley floor Class B.

Whitewater Canyon is a narrow canyon dominated by the Whitewater River and its whitish boulders of the wash. The riparian vegetation contrasts with the stark canyon walls which contain views beyond the rim. The east side is abrupt and nearly devoid of vegetation. The western side is more sloping and covered with vegetation.

The canyon has two small developments, Bonnie Bell and the Trout Farm, which do not dominate the landscape. The portal of the canyon has a small but conspicuous quarry and rock business, and views of Windy Point and San Jacinto Mountains.

Lower canyon views include the barren rock knolls and eroded eastern side of Painted Hill (which vary in color from gray to pinks), the southeast slope of Whitewater Hill, and the ridge to the north. The towers of several utility lines which cross the canyon are very visible. The switchbacks of a dirt road are prominent on the western slope, appearing as a contrasting pale scar on the canyon side.

The upper Whitewater Canyon is more natural, with a narrow dead-end road, the only prominent intrusion on a remote and scenic landscape. A small microwave installation can be seen in southwesterly views. The northern end is dominated by cliffs of bare brown rock. The Bureau rates this area as Class A scenic quality.

The Upper Coachella Valley occupies the entire central study area, and locks the distinct image and quality of the San Gorgonio Pass and Whitewater Canyon areas. Viewing distances, are generally long and permit panoramic views of distant peaks, notably San Jacinto Peak and San Gorgonio Mountain. Atmospheric effects can reduce visibility looking east considerably.

The valley floor is relatively smooth with undulations caused by alluvial fans at the borders. Expanses of whitish-gray gravel occur in the Whitewater River, Mission Creek, and Morongo washes. Elsewhere the ground is

more beige in color. Vegetation is scattered over most of the valley floor, giving it a medium grain texture. Windbreaks and small clumps of trees near roadways provide local interest.

A variety of development is scattered over much of the central valley floor: low density residential, ranches, minor roads, Interstate Highway 10, and State Highways 111 and 62, utility corridors, electricity substations, low flood control structures, and railway. In several places, these elements combine to dominate the scene and produce at best a disordered landscape. Another distinctive feature is the Bendix wind machine near the western end of the Coachella Valley floor. Its scale and the novel shape of its three blades makes it evident in some view directions from 5 or more miles away.

In the northwest, the Devil's Garden Ridge forms an irregular low ridge-line which rises in steep spurs and ravines, brownish-beige in color with the slopes lightly dotted with vegetation. The higher and steeper rock surfaces are exposed by erosion and mining, varying from pale gray to bright whitish pink.

The northeastern side of the area is formed by the front ranges of the Little San Bernardino Mountains. These are sandy-colored, ruggedly dissected hills, dotted sparsely with vegetation. The eastern end is partially enclosed by the Indio Hills, a low, sloping rise. Between these hills and Palm Springs, the Upper Coachella Valley floor "bleeds out" through a wide portal into the next visual area.

The west end of the Coachella Valley is marked by the well-defined portal of San Geronimo Pass between Windy Point and the Whitewater mountains. For drivers southbound on Highway 62 and westbound on Highway 10, it represents a focal point in their field of view. It is predominantly beige in color and sparsely vegetated. The reflective white cones of the microwave tower atop Whitewater Hill are clearly visible in frontlighting, from 8 or more miles away. By comparison, two water tanks which are painted mushroom-gray and are below the skyline are less conspicuous in most middle-ground views. One or two homes have been built on the flanks of the Hill. The powerlines which pass Whitewater Hill via the saddle to the north are not prominent, as seen against the backdrop of the recognizable skyline of Alta Mesa. Windy Point is a focal feature for westbound travelers on Highway 111.

Another topographic feature, Garnet Hill, lies in the center of the Valley, forms a significant landmark in an otherwise relatively featureless plain and is a pale sandy-gray in color. Pale sand dunes adjoin the hill, and the west end is degraded visually by mineral workings, a substation, transportation node, and commercial development.

Three areas of settlement are worthy of mention as sub-areas within the Upper Coachella Valley. Palm Springs is the largest, comprising a sprawl of irrigated golf courses and residential and commercial development around a denser north-south commercial core.

Views out from the city are largely restricted to the adjoining San Jacinto mountainsides and ranges to the south. At the northern fringe of the built-up area, views across the Coachella plain are unobstructed. Radio towers, meteorological towers and utility lines are also evident in this area.

North Palm Springs is a small community of homes and limited commercial development near the middle of the area. It is marked by clusters of trees and poles which hinder outward views. Several utility lines pass by or through the town, distracting attention from background views to the north. From the edge of town, the Bendix wind machine is evident and the skylines of Whitewater Hill, Alta Mesa, San Jacinto Peak, and the higher ridges on either side of San Gorgonio Pass are prominent.

Desert Hot Springs occupies a moderately sloping area at the foot of the Little San Bernardino Mountains. Its position affords panoramas of the San Jacinto and San Gorgonio Mountains, and glimpses towards Whitewater Hill.

To the south of Desert Hot Springs as far as Seven Palms Valley lies an area of scattered housing. The Bureau rates this area as scenic quality Class C.

The northern end of the Lower Coachella Valley merges gradually into the Upper Coachella Valley. The valley floor is flat and dominated by creosote bush vegetation, with fewer washes than in the upper valley. It contains scattered development and agricultural land. A distinctive feature of this unit are the long windbreaks of medium gray-green trees. The north side of this unit is clearly marked by the smooth skylines of Flat Top Mountain and Edom Hill. The slopes are quite steep but regular, sparsely vegetated, and a pale sandy color. Flat Top Mountain is dominated by the powerlines which crown it, and both hills are extensively scarred by pale dirt roads. The Bureau rates this area as scenic quality Class C.

VISUAL SENSITIVITY AND VISIBILITY

The study area is situated along Interstate Highway 10 as it passes through the San Gorgonio Pass, a major portal to the Los Angeles Basin. The environs are also traversed by a number of Scenic Highways, contain a variety of recreation opportunities and are bound on the south by Palm Springs a popular center of leisure and affluence.

The groups of people that view the area are highly varied from full year residents, second home dwellers (November to May), tourists and short term visitors, and interstate and highway travelers.

Because the characteristic landscape is exposed to full view, the area is highly visible from any number of viewing situations.

Table III-9 in the San Gorgonio Wind Resource Study EIR/EIS illustrates relative visibility in the study area. This analysis indicates several locations which are highly visible and are significant in the characteristic landscape including Whitewater Hill, Windy Point, Alta Mesa, Devils Garden Ridge, and the San Jacinto Mountains.

There are also a number of variables that will effect the visibility of the area such as viewing distance, mode of travel, angle of view, time of day and/or year, and atmospheric conditions which could make some parts of the landscape more important than others.

The Bureau has conducted a number of studies and planning reports in this area. In 1978, the Bureau rated the entire area as having a relatively high sensitivity based on high use volume and user attitudes. Other studies tend to reinforce the idea that people recreating in the desert have a high level of concern for the quality of the landscape (visual resource). These studies were conducted by Harbicht Research Incorporated (1981) for Riverside County and Galley's (1978) national survey for the Bureau's Desert Plan.

GEOTECHNICAL CONDITIONS

The geologic conditions of the general area have been described in the generic EIR/EIS (March 1982). To simplify discussion of site-specific geotechnical conditions, the study area has been divided into four geotechnical categories based on geologic conditions. The relationship of the development proposals to these categories is shown in Table 3-1 and Map 3-3.

Category I areas include uplands which range from gently sloping areas of low relief to rugged mountainous areas. The areas in this category are shown as bedrock, or conglomerate and fanglomerate on the map of Geotechnical Considerations in the generic EIR/EIS. The materials in these areas should generally provide good foundation support. With the exception of landsliding and slope instability, no significant geotechnical problems would be expected.

TABLE 3-1

GEOTECHNICAL CATEGORIZATION FOR SITE PROPOSALS

<u>Applicant</u>	<u>Geotechnical Category in Which Site is Located</u>		
	<u>Category I</u>	<u>Category II</u>	<u>Category III</u>
Windfarms	Phase I, II, III		Phase IV
U.S. Windpower	Whitewater Canyon Whitewater River	Whitewater River	Whitewater Hill
PanAero	Facility II, Northwest; Facility III, IV	Facility II, East	Facility I
SCE	Bear Stearns/ Bendix WECS Tech	Boeing	Ventus Westinghouse
San Geronio Farms	All Phases		
City of Riverside	All Phases		
Smart	All Phases		

Category II includes only the moderately sloping alluvial fan extending from the mouth of Whitewater Canyon to the base of the San Jacinto Mountains near Windy Point. This area is underlain primarily by recently deposited unconsolidated, coarse-grained alluvium including numerous boulders, many of which weigh several tons. The geologic and historic evidence indicates that this area is susceptible to very strong stream flooding, scouring and possibly mud-flows. In addition, abrasion by blowing sand is quite strong, at least locally.

Category III areas are gently sloping, slightly dissected to undissected active surfaces of alluvial fans and flood plains which are generally coterminous with flood-prone areas shown on the Surface Hydrology map of the generic EIR/EIS. These areas are underlain by recently deposited unconsolidated, generally coarse-grained alluvium with minor amounts of silt or clay. These areas are also sources of windblown sand, particularly the Whitewater River flood plain. Scour deposition and abrasion due to eolian transport of sand are locally severe.

Areas in a fourth category would include inactive, stabilized surfaces of alluvial fans and pediment fan which are underlain by pre-Holocene deposits. Although geotechnical constraints would be minimal, no sites have been proposed on such areas.

Earthquake shaking and surface rupture along faults may effect any of the categorized areas. Severe earthquakes have occurred fairly frequently in the study area based on geologic and historical evidence. Severe earthquakes (greater than 6.5 on the Richter Scale) can be expected on any of the major nearby faults (including the Mission Creek and Banning faults).

SOILS

The soils of the study area can be divided into three basic groups: upland, terrace and alluvial soils of the valley floor. All of the upland and terrace sites, with the exception of the PanAero sites in the Indio Hills, are located on the Chuckawalla-Badland soil association. This association is characterized by gently sloping to very steep, well drained to excessively drained sands, cobbly fine sandy loams and very gravelly sandy loams. The PanAero Edom Hill site is situated upon the Badlands Carsitas association. This association is characterized by nearly level to very steep, excessively drained fine sands, sands, gravelly sands and cobbly sands.

The soils of the Coachella Valley floor belong to the Carsitas Myoma-Carrizo association which includes nearly level to moderately steep, somewhat excessively drained fine sands, gravelly sands, cobbly sands and stony sands on alluvial fans and valley fill.

Upland and terrace soils of the San Bernardino Mountains and the Indio Hills have recently been described by the Bureau of Land Management as "highly sensitive to surface disturbance." According to their evaluation soils on undifferentiated mountains, hills and badlands within this category occur on moderately steep to very steep slopes (15 to 75 percent) making these soils very susceptible to water erosion if disturbed. Many of the soils are shallow (less than 20"), resulting in a major impact on the soil profile when soil is lost by erosion.

soils developed on the alluvial fans and sedimentary deposits within the San Geronio, Whitewater and Mission Creek flood plains are of medium sensitivity. Surface textures vary widely from fine sands to stony sands. The land surface is level to moderately sloping (less than 10 percent).

Each of the proposed sites have been characterized in Table 3-2 for their susceptibility to erosion and flooding. Generally, the upland and terrace sites, because of their greater steepness, would be more susceptible to water erosion and less susceptible to flooding and wind erosion. Areas in and adjacent to the Whitewater River floodplain are flood prone and serve as a source and deposition area for blowing sand as depicted on the Geotechnical Conditions Map 3-3.

Blow sand areas of active wind erosion and sand deposition are a matter of concern within the Coachella Valley. The flood plain of Whitewater River, covering an area of about 14 square miles from near the intersection of Highways 10 and 111 to Indian Avenue, plus the area between the Indio Hills and Thousand Palms is considered to be an area of active wind erosion. Minor areas of sand dune formation are located one and two miles west of Windy Point and between one and three miles southeast of North Palm Springs. The major area of sand dune formation in Coachella Valley extends south from Thousand Palms, with most of the area out of the wind study zone. Areas affected by wind blown sand, either from deflation (sand removal) or deposition have the following development considerations:

Soils can be eroded from foundations causing settlement, small stationary objects can be buried, and dunes can form around utility lines causing increased stress and possible snapping.

Human influences can aggravate blow sand problems, through natural drainage alterations, large-scale construction projects, development on unstable desert soils, and indiscriminate disturbance and removal of existing vegetation.

HYDROLOGY

SURFACE HYDROLOGY

Except at high elevations, precipitation in the Area is scant. Most of the western central mountain area receives less than 12 inches per year, and the rest of the area receives less than 5 inches per year. Only at elevations above 5,000 feet near the west central mountain area are these values exceeded. Annual totals in the vicinity of the San Jacinto Mountains and the San Bernardino Mountains reach 40 inches or more.

Rainfall totals vary considerably from year to year. In the Coachella Valley, for example, 1 year in 20 can be expected to produce a low of less than 0.5 inches and a high totalling more than 8 inches.

Rainfall in the area may be expected to reach or exceed intensities of 0.50 inch per hour, 1 inch in 6 hours, and 1.25 inches in 24 hours with a

frequency of about once in 2 years. These values may increase to 1.25 inches per hour, 3.00 inches in 6 hours, and 4.25 inches in 24 hours with a frequency of once in 100 years. At some points in the San Jacinto and Santa Rosa Mountains precipitation rates are as great as 0.75 inch per hour, 2.50 inches in 6 hours and 5.00 inches in 24 hours with a frequency of once in 2 years.

With a frequency of once in 100 years these amounts may increase to 2.00 inches per hour, 6.50 inches in 6 hours, and 12.15 inches in 24 hours. Over most of the Area rainfall is heaviest in December through March with occasional heavy thundershowers July through August.

On flat or gently sloping terrain these local heavy showers may occasionally close highways for brief periods. In the mountains damage is sometimes reported from mudflows and erosion associated with heavy rain.

During periods of heavy rainfall, runoff from the canyons may flow as sheets of water for relatively short distances before seeping into the ground and becoming part of the groundwater regime. Normal amounts of rainfall will usually produce runoff that remains within previously established natural channels. During intensive rainfall and flash flooding, the surface runoff may be on the order of 2 or 3 feet deep. Table 3-2 shows the location of floodprone areas. Damage possible from flooding within the study area includes road wash outs, bank erosion, and snapped or downed utility poles.

The main channels of Mission Creek and the Whitewater River have been maintained to keep them free-flowing, thereby decreasing the potential for flooding. Levees have been constructed along the Whitewater River north and northeast of Palm Springs to protect residential and commercial land and structures from flooding.

WATER SUPPLY

All proposed wind turbine sites fall within the boundaries of either the Desert Hot Springs County Water District, Desert Water Agency or the Coachella Valley Water District. Representatives of the three water agencies indicate that the existing water supply would probably be adequate to construct and maintain wind turbine installations.

FLOOD CONTROL

The principal drainage within the area is provided by the Whitewater River and its tributaries, the San Geronio River, Mission Creek, and the Little and Big Morongo Creeks which drain surface water from the San Bernardino Mountains to the north. A number of tributary canyons provide additional runoff to Whitewater River from the San Jacinto Mountains which border the southern boundary of the project. The major canyons are Snow Canyon, Chino Canyon, and Palm Canyon. Most of the rivers and creeks are intermittent; that is, they flow only during certain times of the year. The lower portion of Whitewater River contains surface water for a longer period of time due to recharge from the Colorado River Aqueduct and excess irrigation water from many golf courses and greenbelt areas in and around Palm Springs.

TABLE 3-2
EROSION HAZARD AND FLOOD PRONENESS

	Township & Range	Sections	Geomorphic Type	Soil Associations	Erosion Hazard Water	Erosion Hazard Wind	Flood Hazard
Windfarms							
Site I	3S/3E	1,2,3,11,12	Upland Floodplain	Chuckawalla-Badlands and Carsitas-Myoma-Carrizo	slight to very high	slight to high	slight to high
Site II	2S/3E	27,28,33,34	Upland	Chuckawalla-Badlands	high	slight	slight
	3S/3E	3,4	Upland	Chuckawalla-Badlands	very high	slight	slight
Site III	2S/3E	23,24,25,26, 35,36	Terrace	Chuckawalla-Badlands	high	slight to high	slight
	2S/4E	29,30,31,32	Upland	Carsitas-Myoma-Carrizo	slight to moderate	slight to high	slight
	3S/3E	1,12	Terrace	Chuckawalla-Badlands Carsitas-Myoma-Carrizo	slight to very high	slight to high	moderate
Site IV	3S/4E	6,7	Terrace	Chuckawalla-Badlands Carsitas-Myoma-Carrizo	slight to very high	slight to high	slight
	3S/4E	19,20,21,22, 23,27,28,29,30	Floodplain	Carsitas-Myoma-Carrizo	slight	very high	high
U.S. Windpower							
Canyon Site	2S/3E	33,34	Upland	Chuckawalla-Badlands	high	slight to high	slight
	3S/3E	4	Upland	Chuckawalla-Badlands	very high	slight	slight
White Water River	3S/3E	12	Floodplain	Chuckawalla-Badlands	slight to very high	slight to high	slight
	3S/3E	14	Floodplain	Carsitas-Myoma-Carrizo	slight to very high	slight to high	high
	3S/3E	24	Floodplain	Chuckawalla-Badlands	slight to moderate	slight to high	high
White Water Hill	3S/4E	20,22,28	Floodplain	Carsitas-Myoma-Carrizo	slight to moderate	slight to high	high
Pan Aero							
F ₁	3S/4E	20,22,28,32	Floodplain	Carsitas-Myoma-Carrizo	slight to moderate	slight to very high	high
F ₂	3S/3E	14,24	Floodplain	Carsitas-Myoma-Carrizo	slight to moderate	slight to very high	high
F ₂ NE	2S/3E	27,28,29,33,34	Upland	Chuckawalla-Badlands	high	slight to high	slight
	3S/3E	4	Upland	Chuckawalla-Badlands	high	slight to high	slight
F ₃	3S/5E	24,26,28 32,34	Upland	Badlands-Carsitas	slight to very high	slight to high	slight to high
F ₄	3S/6E	30	Upland	Badlands-Carsitas	slight to very high	slight to high	slight to high
SCE							
Boeing	3S/3E	14	Floodplain	Carsitas-Myoma-Carrizo	slight to very high	slight to high	high
Bear Stearns/Bendix	3S/3E	4	Terrace	Chuckawalla-Badlands	very high	slight	slight
WECS-TECH	3S/3E	12	Terrace	Chuckawalla-Badlands	very high	slight to high	slight
Westinghouse	3S/4E	22	Floodplain	Carsitas-Myoma-Carrizo	moderate	high	high
Ventus	3S/4E	20,28	Floodplain	Carsitas-Myoma-Carrizo	moderate	slight to very high	high
San Geronio Farms Inc.	3S/3E	12	Terrace	Carsitas-Myoma-Carrizo Chuckawalla-Badlands	slight to very high	slight to high	none to moderate
Smart and Company	3S/3E	24	Terrace	Rock Outcrop-Lithic Torripsammet	high	moderate	slight
City of Riverside	2S/3E	34	Upland	Chuckawalla-Badlands	high	slight	slight

Very little streamflow occurs in the area except at high elevations in the winter and spring months, and in the desert valleys during and immediately after rainstorms. Most damaging floods result from general winter storms, which may last as long as four days and result in rainfall over large areas. Winter storms are generally of north Pacific origin. Damaging floods may also result from intense rainfall accompanying tropical hurricanes that originate off the west coast of Mexico and move north of their usual path to cross Southern California. Thunderstorms may also cause short duration, high intensity rainfall over small areas either independently or in conjunction with general storms. Damaging floods occurred in the Colorado Desert in 1916, 1927, 1938, 1961, 1965, 1966 and 1969.

Three persons lost their lives during the 1965 flood in the Whitewater River Basin and property damage exceeded \$3 million. During the 1969 floods, a boy was drowned and property damage totalled \$11.8 million. In the Cities of Cabazon and Palm Springs, about 600 residents had to be evacuated from inundated areas.

Although some areas are protected by flood control improvements, flood problems exist where improvements are lacking, or where existing measures are inadequate to mitigate damages that each year pose an increasing threat to an expanding economy. Streambank erosion and sediment deposition are major problems.

Flood control projects which have been constructed include the San Geronio River levee at Banning, Tahchevah Creek detention reservoir and channel improvements in the City of Palm Springs, and the Chino Canyon improvements in the City of Palm Springs. The latter provides protection against floods to 9,000 acres of valuable property within the City. Its protective levees are one-half mile south of Section 28,T.3S., R.4E. proposed by several developers for wind turbine installations.

BIOLOGICAL RESOURCES

VEGETATION

Major Habitat Areas

Six general habitat types are found in the study area (Table 3-3). Their distribution is determined by temperature, moisture, soil type, elevation, and topography.

Special Habitat Areas

Whitewater Canyon Area of Critical Environmental Concern (ACEC)

This ACEC has special biological values, including: 1) a variety of habitats and ecotones extending from washes and windblown sand at low elevations to pinyon-juniper woodland and desert chapparral at higher elevations in the San Bernardino Mountains; 2) a rich, abundant, and unusual reptilian fauna; 3) riparian areas, including a palm oasis on public and private lands; and 4) a number of raptor nesting sites (Bureau of Land Management 1980). The reptile values have been recognized by scientists, students, recreationists and commercial collectors.

Big Morongo Canyon ACEC

Big Morongo Canyon is designated as an ACEC because of its high wildlife and vegetation values. There is: 1) extensive riparian vegetation of cotton- wood and willows; 2) habitat for the State-listed endangered species, the Least Bell's Vireo; 3) important watering sites for desert bighorn sheep; and 4) adjacent preserves of the Nature Conservancy and County dedicated to conservation of the biological values. Big Morongo has a national reputation for bird watchers. Big Morongo lies outside the areas proposed for wind energy development, but it is still partially within the study area.

TABLE 3-3
GENERAL HABITAT TYPES

<u>Descriptive Name</u>	<u>Comments</u>
Creosote Bush Scrub	Most extensive habitat type in the wind resource area. Found below 4000 ft elevation on well-drained soils of slopes, alluvial fans, and valley floors. The dominant species is creosote bush. Associated shrubs include bursage (<u>Ambrosia dumosa</u>) and brittle bush (<u>Encelia farinosa</u>). Many annual species emerge when sufficient precipitation occurs.
Dry Wash	Well-developed drainage areas created by periodic flooding and runoff from higher ground. Dominant species include creosote bush, palo verde (<u>Cercidium floridum</u>), and ironwood (<u>Olneya tesota</u>).
Sand Dunes	Windblown sand deposits are located at lower elevations in the valley. Dominant plant species include creosote bush, saltbush (<u>Atriplex canescens</u>), and mesquite (<u>Prosopis glandulosa</u>).
Mountain	Occurs in a rugged section in the northwestern portion of the study area where the elevation rises to about 4400 ft above sea level. Parts of this area have been preliminarily recommended for wilderness designation.
Riparian	There are several riparian areas here: Cottonwood, Whitewater, and Big Morongo Canyons; Willow Hole; one palm oasis in Whitewater Canyon (Sec. 35-36, T2S, R3E) and another on the study area boundary at the junction of Sect. 22 and 23, T3S, R3E; and the Nature Conservancy preserve, Oasis de los Osos.

SOURCE: Bureau of Land Management (1979, 1980)

Other Riparian Areas

There are several other riparian sites within the study area, two of which are on or adjacent to public lands. Cottonwood Canyon in the San Bernardino Mountains has extensive habitat over a distance of about 2.4 linear miles. This canyon has had no wildlife or vegetation surveys and little human disturbance. Because of the close proximity to Whitewater Canyon, the biological values may be similar.

Willow Hole has native palm trees (Washingtonia filifera), tamarisk, mesquite, saltbush (Atriplex sp.), and giant reed (Arundo donax). Biological surveys have been extremely limited here (McKernan and Schreiber in prep.); however the State-listed endangered Least Bell's Vireo is known to occur.

Other riparian sites are shown on Map 3-5.

Sand Dunes

Sand dune systems, especially the larger masses, are often biological islands where plants and animals have developed specialized forms and adaptations. The Coachella Valley sand dunes and sheets support several such unique forms, including the Coachella Valley fringe-toed lizard (Uma inornata), the flat-tailed horned lizard (Phrynosoma m'calli), and the Coachella Valley milk vetch (Astragalus lentiginosus var. coachellae), and the endemic giant red velvet mite (Dinothrombium pandorae) (Tevis and Newell 1962). The giant red velvet mite is known only from the windblown sand habitats of the Coachella Valley. There are likely to be other endemic invertebrate species, but few surveys have been made on this potentially large group of animals.

It is important to note here that the giant palm borer (Dinapate wrightii) is endemic to the native fan palms (Washingtonia filifera) in the wind resource study area (Baker 1971). The giant palm borer breeds only in the native palms.

Other Special Plant Assemblages

Shrub Euphorbia (Euphorbia misera) occurs on sea bluffs, two Channel Islands, and into Lower California with one notable exception (Jaeger 1941; Munz 1974; LaPre personal communication). There is a small, disjunct colony of this coastal species in creosote bush vegetation in Sec. 12, T3S, R3E (near Bench Mark 1641). This colony, the only one known outside the normal distribution, is a relict from the Pliocene period when marine waters occupied the trough between the Peninsular Range and the San Bernardino Mountains. The exact location of the colony and its extent is not known. Approximate location is shown on Map 3-5.

Rare, Threatened and Endangered Plant Species

Four species are proposed for Federal listing as threatened or endangered (U.S. Fish and Wildlife Service 1981), and three of the same group are also considered rare or endangered by the California Native Plant Society (CNPS) (Smith et al. 1980, Smith 1981).

These species and their status are described in Table 3-4 and Appendix I; known locations are depicted on Map 3-5.

There have been no surveys of the study area to determine locations of these rare and endangered plant species. Because some are annuals and may not bloom every year, field surveys and mapping may require several seasons.

WILDLIFE

Animals in the area are those typically associated with desert habitats and vegetation of the Western Colorado Desert. Animal life is most abundant near riparian areas, springs, and other areas where water and associated plants may be found. This is particularly true of both resident and migratory birds.

Small mammals include pocket mice, kangaroo rats, ground squirrels, and many others. Of particular interest is the round-tailed ground squirrel (Spermophilus tereticaudus chlorus) in that this subspecies is known only from the Coachella Valley (Hall and Kelson 1959) where it is confined to areas of windblown sand and alkali sink. Elliot (1904) reported specimens from level sandy areas and burrows around mesquite.

Larger species include the desert cottontail (Sylvilagus auduboni), black-tailed jackrabbit (Lepus californicus), coyote (Canis latrans), and mule deer (Odocoileus hemionus). Desert bighorn sheep (Ovis canadensis nelsoni) may enter the northwest corner of the study area from the Little San Bernardino Mountains, and the State-listed rare peninsular bighorn sheep (O. c. cremnobates) may enter the southwestern part of the area from the San Jacinto Mountains.

Important breeding birds include the Cooper's Hawk (Accipiter cooperii), Golden Eagle (Aquila chrysaetos), Prairie Falcon (Falco mexicanus), Gambel's Quail (Lophortyx gambelii), Mourning Dove (Zenaidura macroura), Roadrunner (Geococcyx californianus), Burrowing Owl (Athene cunicularia), and Least Bell's Vireo (Vireo bellii pusillus).

The study area is an important ecotonal zone for reptiles. The reptilian fauna is particularly rich, with many species and subspecies reaching the eastern, western, northern, or southern boundaries of their geographic ranges. Elements from both the Mojave and Colorado Deserts are present, as are species typical of the coastal and peninsular ranges. Some more common species are the side-blotched lizard (Uta stansburiana), desert iguana (Dipsosaurus dorsalis), Coachella Valley fringe-toed lizard (Uma inornata), western fence lizard (Sceloporus occidentalis), rosy boa (Lichanura trivirgata), gopher snake (Pituophis melanoleucus), glossy snake (Arizona elegans), sidewinder (Crotalus cerastes), speckled rattlesnake (Crotalus mitchelli), and common kingsnake (Lampropeltis getulus).

No fish occur in the limited water of the study area, with the exception of those raised at the commercial trout farm in Whitewater Canyon.

TABLE 3-4

Rare, Threatened, and Endangered Plant Species

<u>Species</u>	<u>Status and Comments</u>
<u>Astragalus lentiginosus</u> var. <u>cochellae</u> Coachella Valley milk- vetch	Under consideration for Federal listing as an endangered or threatened species (U.S. Fish and Wildlife Service 1981). Found in sandy places below 1200 ft in creosote bush scrub. NOTE: This taxon has been confused in the California Native Plant Society (CNPS) inventory (Smith et al. 1980, Smith 1981) and has not been properly located by quadrangle maps in some files.
<u>Euphorbia platysperma</u> flat-seeded spurge	Under consideration for Federal listing as an endangered or threatened species (U.S. Fish and Wildlife Service 1981); also on List 2 of rare and endangered species of the CNPS (Smith et al. 1980, Smith 1981). Found in dry, sandy washes below 1000 ft in creosote bush scrub.
<u>Linanthus maculatus</u> Little San Bernardino Mountain Linanthus	Under consideration for Federal listing as an endangered or threatened species (U.S. Fish and Wildlife Service 1981); also on CNPS List 2 of rare and endangered plants (Smith et al. 1980, Smith 1981). Found on sandy fans at 500 to 4000 ft elevations in creosote bush scrub and Joshua tree (<u>Yucca brevifolia</u>) woodlands.
<u>Monardella robisonii</u> Robison's Monardella	Under consideration for Federal listing as an endangered or threatened species (U.S. Fish and Wildlife Service 1981); also on CNPS List 2 of rare and endangered plants (Smith et al. 1980, Smith 1981). One observation on the border of Sections 8 and 9, T.2S., R.4E.

SOURCE: Bureau of Land Management (1982)

Migratory Birds (Principally Songbirds)

As mentioned above, the study area is a major bird migration area. One unpublished report (McCrary et al. 1981) directly concerns nocturnal bird migration through the area during the Spring of 1981. These preliminary results of a Southern California Edison Company sponsored study emphasize the importance of the area to songbirds, shorebirds, and waterfowl. The preferred direction of migration of songbirds was generally northwest through the Coachella Valley (see Map 3-4), but when strong winds were encountered near the entrance to San Geronio Pass, birds tended to move eastward with the winds. When wind speed decreased or was variable, the songbirds again moved to the northwest. A maximum migration rate of 22,800 birds passing a mile-long line perpendicular to the direction of flight was recorded during the night of April 22-23 at Observation Site C just southeast of the wind resource study area near the entrance of Thou-

sand Palms Canyon. The overall average migration traffic rate at 5 sites (125 hours of observations between April 6 and May 12) in and near the wind resource study area was $3,037 \pm 527$ songbirds per hour along a mile front (see Sites A, B, C, and D on Map; Site E is off the map).

The average number of migratory bird species observed at 11 sites in or very near the study area during the Spring of 1980 was 58.5 per site, compared to an average of 25.7 breeding species per site (McKernan and Schreiber in prep.). Thus, 69.5 percent of the bird species in the study area at that time were considered migratory. Comparable average figures for the Fall of 1980 are 26.1 species of breeding birds per site and 50.5 species of migratory birds per site (thus, 65.9 percent of the fall species are migratory). The significance of the Coachella Valley, San Geronio Pass, and Morongo Valley area as a bird migration route to and from the Salton Sea, Imperial Valley, and points south is considerable. Studies clearly show that there is a denser and more diverse avifauna in parts of the wind resource area than would be expected elsewhere in places with less complex weather patterns, less topographic variation, and a less strategic relationship to major bird wintering and migration stopover areas (e.g., the Salton Sea).

Shorebirds and Waterfowl

Preliminary data indicate that the wind resource area is not critical to breeding shorebirds and waterfowl. Also, the infrequency of observations of migrating shorebirds and waterfowl during the McCrary et al. (1981) study indicates either 1) that these birds migrate at altitudes above the field of view of the equipment used or 2) that shorebirds and waterfowl do not migrate through the area in large numbers. Only 21 flocks of birds (primarily shorebirds) were observed during the 125 hours of observation by McCrary et al. (1981); the remainder were individual birds (assumed to be songbirds). However, many waterfowl and shorebird species are reported for the Whitewater Settling Ponds near Hugo, (Map 3-4) (McKernan and Schreiber in prep.), and their access to and from those ponds is of concern.

Raptors

Raptor data indicate considerable breeding in suitable habitats in the study area. Sharp-shinned Hawks (Accipiter striatus), Cooper's Hawks, Red-tailed Hawks (Buteo jamaicensis), Golden Eagles, Prairie Falcons, American Kestrels (Falco sparverius), Barn Owls (Tyto alba), Screech Owls (Otus asio), Great Horned Owls (Bubo virginianus), and Burrowing Owls are all known to nest in the study area. Generally, breeding raptors require two functionally different, and usually physically different, habitat components: a breeding site and foraging areas. Nest sites are usually in trees (riparian areas, especially) or on cliffs. The major cliff-nesting species are Prairie Falcons (8 nest sites in the study area) and Golden Eagles (1 nest site) (Map 3-4). Telemetry studies of Prairie Falcons in Idaho (Dunstan et al. 1978) indicate that nearly half of 635 foraging flights exceeded 4 miles from the eyrie, about 19 percent exceeded 10 miles, and 8 percent exceeded 14 miles. The maximum breeding range for all individual Prairie Falcons (N=18) from 1975-1977 was 27.4 ± 12.5 sq mi. The maximum breeding range for Golden Eagles (N=15) was 8.67 ± 5.39 sq mi. In the western Mohave Desert of California, Harmata et al. (1978) found the mean individual home range size for Prairie Falcons (N=6) to be 22.8 sq mi. Maximum distance of forage flights was about 7.5 mi.

Birds of Riparian Zones

All riparian/wetland sites in the wind resource study area are shown on Map 3-4. Data from McKernan and Schrieber (in prep.) show the importance of permanent water to birds. Normally dry or intermittently dry areas (e.g., Devers WTG Site and Whitewater Settling Ponds) attract 51 percent to 78 percent fewer species of birds during spring and fall migration periods than some of the better riparian sites (e.g., Whitewater Canyon and Morongo Valley). High species diversity at desert wetland/riparian areas has also been noted in many other studies throughout the California Desert (England and Laudenslayer in press; England, Foreman, and Laudenslayer in press).

One must view desert riparian areas as providing for the needs of birds and some mammals from miles around, with considerable and constant ingress and egress of individual animals. The opportunity for nesting by birds provided by riparian vegetation is only one of its values, because wet areas also provide drinking water, food, bathing opportunities, shade, and protective cover to both residents and periodic users. Similarly, many birds which nest in riparian areas (e.g., towhees, quail, hawks, owls) constantly move out to surrounding habitats to feed, often at considerable distances.

Reptiles and Amphibians

Reptiles can be discussed by dividing the study area into three habitats or regions: 1) the San Jacinto or Coastal side, 2) the San Geronio Pass and the floor of Coachella Valley, and 3) the slopes and mountainous terrain of the San Bernardino and Little San Bernardino Mountains. Species and/or their subspecies may be present in one or more regions. The coastal side has such rock-dwelling species as the granite spiny lizard (Sceloporus orcutti), granite night lizard (Xantusia henshawi), red diamond rattlesnake (Crotalus ruber), and southern pacific rattlesnake (Crotalus viridis helleri).

The valley floor and windblown sand habitats support the Coachella Valley fringe-toed lizard, a federally listed threatened and State-listed endangered species, as well as the rare flat-tailed horned lizard. Both of these species and their habitats are discussed below.

There are some reptiles with subspecies that exhibit morphological characteristics of both desert (north side of San Geronio Pass and Coachella Valley) and coastal (south side of the Pass and Valley) races (Bureau of Land Management 1980). Examples are the banded gecko (Coleonyx variegatus), glossy snake, gopher snake, western patch-nosed snake (Salvadora hexalepis), and rosy boa.

Another interesting example of population variations occurs in the colored lizard (Crotaphytus insularis). There are two populations in the study area, distinct at the species level (Sanborn and Loomis 1979). The two populations apparently are separated by the Whitewater River. One species, Crotaphytus insularis vestigium, is found along the base of the San Jacinto Mountains and the other, C. bicinctores, occurs north and east of San Geronio Pass and the Coachella Valley.

The importance of the Whitewater Canyon area for reptiles has long been recognized by scientists, students, amateur reptile enthusiasts, and commercial reptile collectors (Bureau of Land Management 1980). This area is considered to be the "number one" reptile collecting and observation area in Southern California, particularly for "night driving." Such snakes as the "Whitewater Special" rosy boa are much sought after. These rosy boas have a striking color pattern intermediate between the slate blue background of the coastal subspecies rosefusca with the prominent striping characteristic of the desert subspecies gracia.

The Bureau of Land Management has established an ACEC at Whitewater Canyon and in the surrounding areas to protect and manage these special values. See earlier discussions of the ACEC and Bureau of Land Management (1980c).

Sensitive, Rare, Threatened, and Endangered Animal Species

Six animal species occurring in the study area are protected by either the State or Federal government or both, and a seventh has been and may be considered for BLM sensitive listing. See Table 3-5 for a list of species with comments on status and also Map 3-5 for data on locations.

TABLE 3-5

Sensitive, Rare, Threatened and Endangered Animals

<u>Species</u>	<u>Status and Comments</u>
<u>Gophermus agassizi</u> Desert tortoise	Fully protected by the State of California and under "status review" by the U.S. Fish and Wildlife Service. No important or crucial population centers or habitat in the study area (Berry and Nicholson 1979).
<u>Uma inornata</u> Coachella Valle fringe-toed lizard	Listed as a Federal threatened species (U.S. Fish and Wildlife Service 1980) and a state endangered species (California Dept. of Fish and Game 1980). Occurs in windblown sand deposits at low elevations in a large portion of the Valley (U.S. Fish and Wildlife Service 1981a).
<u>Phrynosoma m'calli</u> Flat-tailed horned lizard	A BLM "sensitive" species (BLM 1980b) and under "status review" by the U.S. Fish and Wildlife Service. California sport fishing regulations have prohibited collection of specimens since 1979. Known to occur in same kind of habitat as <u>Uma inornata</u> in Coachella Valley (Turner et al. 1981b, field notes).
<u>Vireo helii pusillus</u> Least Bell's Vireo	Listed as endangered by the State of California (California Dept. of Fish and Game 1980). Occurs in riparian habitat at sites such as Whitewater Canyon and Big Morongo Canyons and Willow Hole (McKernan and Schreiber in prep.).

- Spermophilus tereticaudus May be considered as a BLM sensitive species;
chiorus subspecies endemic to the Coachella Valley.
Coachella round-tailed Specimens recorded from Palm Springs, Cahegon,
ground squirrel and Whitewater Station (Hall and Kelson 1959).
Habitat as approximately that of Uma inornata.
- ovis canadensis Listed as rare by the State of California
cremnobates (Calif. Dept. of Fish and Game 1980). May enter
Peninsular bighorn study area on extreme southern edge from San
sheep Jacinto Mountains.
- Ovis canadensis nelsoni Considered a sensitive species by the BLM (BLM
Desert bighorn sheep 1980b). There is probable habitat in the moun-
tainous areas of the San Bernardino Mountains
near Whitewater and Cottonwood Canyons. Known
habitat exists in the Little San Bernardino
Mountains near Big Morongo Canyon.
-

Coachella Valley Fringe-toed Lizard

The most significant of the protected species in terms of potential wind energy development is the Coachella Valley fringe-toed lizard (CVFTL). This species has special adaptations for living in windblown sand, such as a flattened body and tail, smooth skin, countersunk jaw, and "fringed" toes that permit it to "swim" in sand (Stebbins 1944). Habitat is limited to windblown sand in San Gorgonio Pass and the Coachella Valley. Location data for the CVFTL (see Map 3-5) were taken from reports by U.S. Fish and Wildlife Service (1981a), La Pré and Cornett (1981), and Turner et al. (1981a).

The delineation for windblown sand habitat shown in Map 3-5 was developed by A.S. England during a preliminary assessment of aerial photographs and field data (A.S. England, personal communication); boundaries do not reflect data gathered from the studies by La Pré and Cornett (1981) and Turner et al. (1981). Some, but not all, potential CVFTL habitat on public lands administered by the BLM has been cursorily surveyed (La Pré and Cornett 1981).

Preferred and "optimal" habitats have not been identified yet (U.S. Fish and Wildlife Service 1981a). England and Nelson (1976) discussed three types of habitats occupied by the species: sand hummocks, sandy plains, and mesquite dunes. Turner et al. (1981) in a study at 10 sites within the Coachella Valley found densities ranging up to 18 individuals/acre within the study area, but they did not find any relationship between density levels and these habitats. They did find significant differences in lizard densities between study plots in apparently undisturbed habitat upwind of tamarisk windbreaks and those downwind of the obstructions. Downwind plots essentially had densities ranging from 4 to 18 individuals/acre. Turner et al. (1981) noted that downwind plots had been subjected to the processes of obstructing windflow, ensuing sand depletion, and surface stabilization for 7 to 17 years. In the plots under study, the areas were rendered unsuitable for CVFTL. "The continuing reception of new sand appears, then, to be an indispensable ecological process insofar as the survival of fringe-toed lizards is concerned..." and "some active passage of sand is necessary."

Weaver (1981, pg. 2, Exhibit 2) has mapped CVFTL habitat areas that are presently developed, stabilized, or are subject to wind shielding and destined for stabilization. He predicts that CVFTL habitat within this zone will someday disappear and that "Uma population(s) will eventually be extinguished in all areas shielded from the natural receipt of windblown sand" (Op cit, pg. 172). The area within the shielded zone contains much of the "better" quality Uma habitat (Weaver, personal communication).

The Coachella Valley Fringe-toed Lizard Advisory Committee (U.S. Fish and Wildlife Service 1981a) has described the reduction of suitable habitat for the lizards from about 200 square miles historically to about 99 square miles in 1979, based on data provided by A.S. England. Not all the 99 square miles is suitable; some undoubtedly has deteriorated due to windbreak construction and habitat fragmentation. Most habitat is in private ownership.

Weaver (personal communication) reports that habitat on public lands is probably not of the best quality. The area at Windy Point (Sec. 24, T.3S., R.3E.) has good quality habitat, but not many lizards, perhaps due to heavy off-road vehicle use. Habitat in Sections 20, 22, and 28, T.3S., R.4E. is probably of relatively low quality, but lizards have been found there. The BLM-administered lands may be of particular importance in the future, however, because they have experienced little or no wind shielding (see Weaver 1981, Exhibit 2).

The CVFTL Advisory Committee (U.S. Fish and Wildlife Service 1981a) cited loss of habitat from urban and agricultural development and windbreak construction as the primary reason for the species' decline. Habitat fragmentation and off-road vehicle use are also contributing factors.

One major concern in protecting the CVFTL involves preservation of habitat in good condition. The U.S. Fish and Wildlife Service recently designated approximately 18 square miles as Critical Habitat (Federal Register, 45(188): 63812-63820, September 25, 1980). One quarter square mile of Critical Habitat occurs in the wind study area; the rest lies immediately east and south. The CVFTL Advisory Committee (U.S. Fish and Wildlife Service 1981a) has proposed that at least one more "large-scale reserve containing viable populations of the lizard and secure habitat" be established. The most important element identified in the Recovery Plan for the species is habitat acquisition.

Flat-tailed Horned Lizard

The distribution and status of the flat-tailed horned lizard has received considerable attention in the last four years. Surveys have been undertaken in Riverside, Imperial, and eastern San Diego Counties, and prime or optimal areas have been identified in Imperial and eastern San Diego Counties, but not in Riverside County (Turner et al. 1978, Turner et al. 1980). Subsequent studies on the CVFTL for the U.S. Army Corps of Engineers in 1980 (Turner et al. 1981a) revealed that flat-tailed horned lizards were present in good abundance on some CVFTL plots in Riverside County in the wind energy study area (Turner, personal communication). In fact, surveys indicated that densities could be as high as in the prime areas in Imperial and eastern San Diego Counties. Certainly there is potential for good to excellent habitat within the wind study area. Until such times as intensive surveys need to be undertaken to determine the

species distribution and relative abundance on BLM administered public lands, we should assume that this species may occur more widely in the study area than the distribution map (Map 3-5) indicates.

Rado (unpublished report) estimated that approximately 57 percent of the optimal habitat and 52 percent of the entire geographic range in California is subjected to one or more land uses with moderate to high potential for habitat degradation or loss. Turner et al. (1980) have stated: "...the original range of this species has been diminished, and the species is not as abundant in certain parts of its range as it once was. Such changes have almost certainly been brought about by human activities. *P. m'calli*, like many other desert species, is not in immediate danger of extinction, but stands in jeopardy because of continued alteration and destruction of its habitat." Turner (personal communication) noted that flat-tailed horned lizards appear to be affected deleteriously by wind-shielding and windbreaks, just as the CVFTL does (Turner et al. 1981b). Both species were absent from plots downwind of windbreaks.

Least Bell's Vireo

The Least Bell's Vireo formerly inhabited the riparian vegetation along streams throughout California. A drastic population decline is inferred from the paucity of recent observations. Two primary casual factors of the decline are widespread destruction of riparian habitat and increasing nest parasitism by Brown-headed Cowbirds (*Molothrus ater*) (Goldwasser 1978; Goldwasser, Gaines, and Wilbur 1980). Probably less than 10 pairs occur in the wind resource area with slightly larger numbers just north in the Morongo Valley area and just south in the Palm Springs/Palm Canyon area. The most recent extensive inventory turned up between 150 and 200 pairs statewide (see Goldwasser, Gaines, and Wilbur 1980 and the addendum thereto). One of the most important continuing management efforts for this species will be to preserve and improve riparian habitat (California Fish and Game Department 1980). This will be of considerable protective value to the Least Bell's Vireo in Whitewater Canyon, Big Morongo Canyon, and, perhaps, Cottonwood Canyon which has not been surveyed for Least Bell's Vireos.

Coachella Round-tailed Ground Squirrel

Little is known about the distribution and status of this species except that noted earlier. To our knowledge, there have been no recent surveys. For the purposes of this report, we will assume that distribution closely parallels that of the CVFTL.

Desert Bighorn Sheep

The San Gorgonio herd of bighorn sheep which enters the northwest corner of the study area in the San Bernardino Mountains contained an estimated 115 animals (Weaver et al. 1972). A current (early 1982) conservative estimate by Terry Russi (personal communication) based on limited data from several hiking trips and one helicopter survey is at least 50-70 animals. He is certain that this herd uses areas in the vicinity of Cottonwood and Whitewater Canyons and that these areas are of moderate to high importance to the herd.

NOISE

Noise levels in the area appear to be low, but few local measurements have been made. Noise in the area originates from both natural and man-made sources. Appendix Table III-PHS-a, generic EIR/EIS, March 1982 illustrates for comparative purposes, noise levels from various sources and their corresponding response in humans.

Natural Sources

Natural noise sources, such as wind and infrequent rain storms, can be significant contributors to ambient noise levels in the study area. This derives from the fact that much of the area is open desert with few significant, man-made noise sources. Measurements made in terrain similar to that of the study area indicate that ambient noise levels in undeveloped areas are about 40 to 45 dB(A) (generic EIR/EIS, March 1982). Rainstorms were found to increase noise levels about 10 to 20 dB(A) above the mean.

Man-made Sources

Some of the most significant man-made noise sources in the wind resource area are associated with transportation corridors. Interstate 10 runs east-west through the study area, parallel to the main line of the Southern Pacific Railroad. Noise levels of 70 dB(A), 65 dB(A), and 60 dB(A) were recorded at distances of 300 ft, 600 ft, and 1,350 ft, respectively, from the centerline of Interstate 10 within the study area. Other highways include Highway 111, which goes southeast from Interstate 10 to Palm Springs. Noise levels equal to, or in excess of, 65 dB(A) have been measured along most state highways in Riverside County (Noise Element, Riverside County General Plan 1975). See Figure III-20, generic EIR/EIS, March 1982 for noise contours near highways in the study area. Transcontinental flights fly over the study area on their way to and from Los Angeles International Airport, about 100 miles to the west. A small airport is located at Palm Springs, just outside the south-central boundary of the wind resource area. Numerous homes and other buildings are scattered throughout the study area and the resort communities of Desert Hot Springs, Thousand Palms, and Palm Springs are respectively located just outside the northeastern, southeastern, and south-central boundaries of the study area. Other sources of noise include motorcycles, refuse trucks, power tools, and construction activities, but no local measurements have been made in regard to these general community noise sources (Noise Element, Riverside County General Plan 1975 (generic EIR/EIS, March 1982)).

COMMUNICATIONS INTERFERENCE

A number of communication facilities operate within the study area, including television, AM and FM radios, microwave, air navigational systems, and 2-way radio. These communication facilities transmit to locations both within and outside the area. Communication facilities located outside of the study area transmit through the area on these same frequencies.

Communication facility sites in the area include (1) Edom Hill; (2) White Water Hill; (3) Windy Point; (4) Devers Substation; and (5) an unnamed site, located three miles northwest of White Water Hill.

Appendix L lists all microwave stations associated with the wind resource study area. Microwave beams are identified on Map 3-6.

CULTURAL RESOURCES

INTRODUCTION

This section discusses only those cultural resources on or within 1/2 mile of public lands that may be affected by the proposed project, alternatives, or variations. A general discussion of cultural values in the region can be found in the generic EIR/EIS (March 1982).

Recorded archaeological resources have been evaluated for their potential National Register of Historic Places eligibility in a preliminary fashion through a matrix system utilizing both criteria set forth in 36 CFR 60 as well as other criteria deemed relevant by professional staff members. More data and/or a field evaluation will be necessary before any of the sites considered potentially eligible for the National Register of Historic Places can be formally submitted for determination of eligibility. This process will be completed where danger of project impact is apparent through the permit process and project design.

Intensive systematic field inventories of the study region and most proposed siting locations have been made (BLM archaeologists have completed a sample inventory of a number of public land parcels where development has been proposed (cf. Ritter 1981). This inventory included about 4 percent of public lands). Prior to construction, all facility locations will be inventoried; recorded sites will be evaluated for their National Register eligibility; and, necessary adjustments or other mitigative measures will be executed per consultation with the State Historic Preservation Officer (SHPO), the Native American Heritage Commission and affected Native American groups.

Consistent with 36 CFR 800 obligations a Programmatic Memorandum of Agreement has been developed with the SHPO and the Advisory Council on Historic Preservation for the California Desert Conservation Area (CDCA) in which this study region occurs. Similarly, a Memorandum of Understanding has been developed between the SHPO, the California Native American Heritage Commission, and BLM, addressing Native American socio-cultural concerns for the CDCA (see Appendix VII, San Geronio Wind Resource Study EIR/EIS, (March 1982)). All project actions will be carried out consistent with the stipulations outlined in these documents.

ARCHAEOLOGICAL RESOURCES

Background

The San Geronio Pass area (fans and riverwash) is a very active zone in terms of wind erosion and deposition, sheetwashing, rilling, gullying, and braided-stream planation. As a result, few older surfaces are present and most archaeological sites probably have been destroyed or covered. The Indio Hills, soft sedimentary beds, are deeply incised and quite active in terms of erosion. While important sites are known for this range of hills, much of the deposits have been eroded with a high probability of site destruction, especially within the western portion of the study area.

While most prehistoric sites are concentrated around major oases, by canyon mouths with perennial streams, or along major east-west trail networks, historic sites tend to relate more to differing economic/resource advantages, such as potential mineral producing locations, along transportation/communication corridors, or where access to public lands was granted through legal process (e.g., "Jackrabbit" homesteads).

The vast majority of unrecorded sites are probably small, of little complexity, and relate to late prehistoric or historic times. The prehistoric sites, for the most part, would probably be specialized task locations associated with foraging or collecting activities, or would represent sites related to the trade-transportation network which generally runs east-west across the study area. Norris and Carrico (1798:Map 1) illustrate aboriginal flood, well, or channel irrigation for much of the area, remains of which would be most difficult to locate.

Historic sites would relate primarily to mining, transportation, communication and settlement.

Site-Specific Discussion

There are 11 sites recorded on public lands within the study region. Of these, seven were recorded during project related surveys (Ritter 1981 and addendum). There are 27 additional sites within one-half mile of public lands. No sites presently on or considered eligible for the National Register of Historic Places are within the study region.

Of the 11 sites, two are trails, one is a sherd scatter along one of the above trails, four are small temporary campsites which probably are surface manifestations, one is a late prehistoric village location (Willow Hole Oasis), one is a roasting area and historic telephone line, and the last two are small historic sites with cairns.

Archaeologically speaking there is a potential for considerable age of cultural remains in the region. However, most sites are apparently late prehistoric, representing a variety of hunting, gathering, and foraging activities. This is probably a factor of population growth as well as preservation.

Considering the early historic explorations, development of roads and railways and associated facilities, ranching and mining activities, and later recreation or retirement oriented settlements, there is a favorable chance that many historic sites of various significance are present in the region, some undoubtedly on public land. For example, there were the early expeditions of Romero-Estudillo (1823-34), Williamson-Blake (1853), and Dr. Isaac Smith (1857).

NATIVE AMERICAN RESOURCES

Based on historic and recent discussions with regional Native Americans, (cf. Bean and Vane 1980, 1982), a number of ethnographically significant locations have been identified on or very close to public lands. The most important would appear to be Whitewater Canyon, designated an Area of Critical Environmental Concern by BLM in part because of contemporary Native American values. Other locations of note include Windy Point, Edom Hill, Cottonwood Canyon and the Devil's Garden vicinity.

Most of the resources identified can be equated with prominent geographic features. Many are tied in with the oral literature of one or more groups and as such relate to a mythological being and/or event.

The locations identified, which are listed in reports on file with BLM in Riverside, include tribal boundaries, trails, villages, plant and animal resource areas, rock art locations, burial locations, canyons, hills, rivers and streams, rocky points, rock piles, prominent rocks, and springs.

Prior to development further consultation with affected Native American groups will be conducted to (1) identify present traditional religious or heritage values and places, (2) determine the significance of previously identified values, (3) assess the resource susceptibility to adverse impacts and (4) determine impact mitigation measures.

Native American consultation will be conducted in accordance with the CDCA PMAO and a Memorandum of Understanding pertaining to Bureau of Land Management, California policy for Native American concerns and cultural resource management between the State Historic Preservation Officer and BLM.

Reservation Coordination (Native American)

No reservation property will be directly effected by project actions on public lands. Efforts were undirected however, to coordinate with local governments including the Monongo and Aqua Caliente Reservation governments during April and May of 1981. The Morongo Tribal Government has expressed a positive interest in the potential development of wind energy. The Aqua Caliente Reservation has identified limited areas of Tribal lands for development feasibility but has not adopted any fiscal position regarding development within Tribal lands. The Tribal governments and/or members of both of these reservations have identified resource concerns on Bureau lands which are addressed elsewhere in this document.

SOCIAL AND ECONOMIC CONDITIONS

POPULATION

The San Geronio Pass Study Area had a population of 8,680 people in 1980. Just outside the Study Area boundaries are the communities of Palm Springs, Desert Hot Springs and Cathedral City. The population of these communities are shown in Table 3-6.

The Study Area and all of the above communities are part of the Riverside-San Bernardino-Ontario Standard Metropolitan Areas (SMSA), population 1,538,000. The cities of San Bernardino (population 117,000) and Riverside (population 170,000) are about 45 miles from the Study Area by interstate highway.

Population growth in this SMSA has been relatively rapid from 1970 to 1980 and rapid growth is expected to continue (see Table 3-7). Population in the Study Area is expected to grow faster than the Riverside County average.

TABLE 3-6

Population Centers Within or Adjacent
to the Study Area (1980)

<u>Place Name</u>	<u>Population</u>
Palm Springs	32,271
Desert Hot Springs	5,941
Cathedral City	11,138
North Palm Springs	500

Source: Generic EIR/EIS, 1982

TABLE 3-7

Projected Population Growth

	<u>1980</u>	<u>Population</u> <u>1990</u>	<u>2000</u>	<u>% Change</u> <u>1980-2000</u>
Riverside County	663,923	927,000	1,051,000	58%
Study Area	8,680	17,055	26,390	204%

Source: Generic EIR/EIS, 1982

HOUSING

In 1980 there were approximately 282,500 housing units in Riverside County, including 71,000 units in the Study Area. The Study Area has had a much higher rate of growth of housing units than the rest of Riverside County, though little of this construction has taken place in San Geronio Pass. A high proportion of housing in the Study Area is second homes.

A relatively high rate of housing growth may be expected to continue, in keeping with the projected population growth rate.

EMPLOYMENT

Employment data for the communities of Palm Springs, Desert Hot Springs, Banning and Beaumont shows that employment is concentrated in the Retail Trade and Services sectors.

Riverside and San Bernardino Counties are highly diversified counties with metropolitan centers at the Cities of Riverside and San Bernardino, respectively. In addition, there are other smaller cities in these counties which are within potential commuting distance of San Geronio Pass. An

active construction sector is present in all of these places though current unemployment is relatively high. Average employment for the Riverside-San Bernardino-Ontario SMSA by private employment sectors is shown in Table 3-8.

TABLE 3-8
1980 Employment for
Riverside-San Bernardino-Ontario SMSA by Sector^{1/}

<u>Industry</u>	<u>Average Employment</u>
Agriculture, Forestry, Fishing	21,118
Mining	2,251
Construction	26,317
Manufacturing	63,680
Transportation & Communication	20,276
Wholesale Trade	15,611
Retail Trade	90,762
Finance, Insurance, Real Estate	18,762
Services	84,350
Non-classified	1,218
Total	344,542

^{1/} Includes only employees covered by unemployment insurance code.

Source: State of California, Employment Development Department
January 27, 1982 (private communication).

TOURISM

A mainstay of the economy of the City of Palm Springs is tourism. The Palm Springs Convention and Visitors Bureau estimates that 2 million visitor nights were spent there by hotel and convention guests in 1980. In addition to this there are the people who are merely passing through and do not stay overnight. The main route of travel for these people is through San Geronio Pass on Interstate Highway 10. For most of these travelers the Stuy Area is background rather than a primary destination.

Tourism and retirement living are expected to continue to be mainstays of the economy in and around adjacent communities.

PUBLIC COST AND REVENUE

For fiscal year 1980-81 the County of Riverside had a total budget of \$304 million. Of this, \$19 million was budgeted for roads. About \$45 million, or 14 percent of the County's revenues came from property taxes. The public lands being considered for wind turbine development do not presently produce any property tax revenue for the County.

ELECTRICITY RATES

For the customers of the potentially affected utilities, Southern California Edison (SCE) and the City of Riverside, electricity rates have been increasing and are expected to increase for the foreseeable future. The major causes of rate increases are: high interest rates, increasing prices for oil and gas, and high costs of new generating facilities.

SCE is expected to need to add 3,531 MW of generating capacity between 1979 and 1992, primarily to meet growth in demand^{1/}. SCE will attempt to diversify its sources by drawing on out-of-state projects and substantially increasing the production from nuclear generating plants in its own system. A vigorous electricity conservation program will be continued to reduce demand growth.

The City of Riverside has no generation capacity of its own. It relies primarily on power supplied by SCE for distribution within the City of Riverside system. Customers are paying a substantial premium to cover the cost of increasing oil and gas prices. The City of Riverside is attempting to diversify its sources to reduce its dependence upon SCE. By 1990 Riverside may be meeting its peak demand of approximately 400 MW by adding entitlements of 40 MW from the San Onofre nuclear plant, 2000 MW from the Intermountain Power Project in Utah, and an unknown amount from the Palo Verde nuclear project in Arizona.

^{1/} Electricity Tomorrow - 1981 Final Report (biennial report), California Energy Commission, January 1981, p. 42.

CHAPTER 4

ENVIRONMENTAL CONSEQUENCES



CHAPTER 4

ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND ALTERNATIVES

INTRODUCTION

This chapter provides the scientific and analytical basis for comparing the proposed and alternative actions. Discussions of these actions include: (1) direct and indirect effects on the environment and their significance; (2) possible conflicts with the objectives of Federal, regional, State, local, and Indian tribe land use plans, policies, and controls for the areas concerneo; and (3) natural or depletable resource requirements.

Environmental elements of major concern (Scoping Process, Chapter 1) which require in-depth analysis of impacts include: visual resources, threatened and endangereo animal and plant species, bird migration, changes in land use, noise, electromagnetic interference and social and economic conditions. Impacts related to safety, wind access and equity are discussed in detail in the San Gorgonio Wind Study EIR/EIS, March 1982.

Impacts on the following environmental elements would also occur: fugitive dust, topography and geology, minerals development, soils, wilderness, cultural resources, and commonly occurring vegetation and wildlife. However, these are considered to be of minor concern and are analyzed in less detail than those elements of major concern.

Some of the impacts of a proposal will be unavoidably adverse, in that standard operating proceoures and mitigating measures as described in Chapters 2 and 4 cannot be successfully applied to entirely prevent adverse environmental consequences (residual impacts).

There may also be an irreversible or irretrievable commitment of resources through the implementation of certain project components. These are resources that would be consumed, destroyed, or lost through construction and operation activities should an alternative be implemented.

The use of resources for the short-term (here considered to be the project life of the proposed or alternative actions [30 years] are examineo for their effects on the maintenance and enhancement of long-term resource productivity (the period following the life of the project).

ASSUMPTIONS AND ANALYSES GUIDELINES

In the analyses of the alternatives it is assumed that:

1. Impact analyses are centered primarily on the construction and operation of the proposed wind turbine generators, access roads, and electrical transmission systems. Impact analyses in certain instances are summarized and referenceo from the generic environmental assessment (San Gorgonio Wind Resource Study, March 1982).

2. Any one or parts of the proposed actions and/or alternatives could be included in the eventual selection of the preferred alternative; therefore, significant impacts of each alternative are analyzeo equally in

depth. Because some of the alternative components are identical in size, function, or design, the environmental impacts associated with their construction and/or operation would also be similar or identical. Where such cases occur the impact analysis is referenced back to the original discussion.

3. The analyses of the impacts are based on the changes that would occur to the affected (existing) environment through the implementation of any one or parts of the proposed alternatives. Analyses include the type, cause, location, duration, and significance of the impacts.

4. Analyses of impacts are limited to the scope as described in Chapter 1, Scoping.

5. Impacts of wind development on private lands are not treated in the analysis, as these impacts will be described in the County's site-specific environmental impact report (EIR).

6. Where insufficient data exists, the "worst case" is analyzed.

7. Where project components and/or areas have been previously studied, relevant data is summarized, consolidated, or simply referenced to previously published studies.

ALTERNATIVE 1: APPLICANTS' PROPOSED ACTIONS

LAND USE

WINDFARMS

Recreation

In Phases I, II, and III, turbines would be erected along approximately six miles of the southeastern and southwestern boundaries of the Whitewater ACEC. Although the turbines would visually dominate the ACEC, recreation values (with the exception of the Pacific Crest Trail) would not be affected.

Four Phase I turbines would be located along one mile of the Pacific Crest Trail (PCT). Although the machines and the access road to be upgraded are outside of the 30-foot easement desired for the PCT, the turbines would dominate the recreational experience along this stretch of the trail. However, direct impacts such as increased safety hazards are expected to be minor, except for the occasional horse spooked by the noise and sight of the machines.

One mile of Phase III turbines would be built on the crest of the ridge east of Whitewater Canyon. Although no formal surveys have been conducted, the PCT is expected to share the same location. As a result, it may be difficult to accommodate both uses and still maintain the PCT easement. However, the section is short and relatively isolated, and no reduction in trail use would be anticipated. The major problem on the ridge may be short-term: the useability of the PCT during turbine construction. The segment of the PCT along the ridgetop would probably be

completed by the time WTG construction occurs in 1985. If so, use of the trail may be curtailed during those months when the turbines and related facilities are being constructed, if simply because of the lack of space available for both activities on top of the ridge.

Phase IV would be located in the Whitewater floodplain within the proposed Whitewater Regional Park. Although turbines would be sited in three sections (20, 22 and 28), only nineteen turbines would be built. The WTGs and related facilities would permanently occupy about 28 acres of the floodplain (one percent of the area). While the WTGs would dominate the Park, Park uses (ORVs, sunbathing, etc.) would not be significantly affected.

The lack of access restrictions may result in increases in vandalism of wind park facilities and heavy use of wind park access roads. This problem would also arise for all other applicants. It should be noted that such occasional damage would constitute a risk assumed by the wind park developer, a risk for which the federal government as the licensing and land-holding agency would not be liable.

Wilderness

The proposed Whitewater wilderness area would be affected by Phase II development only. Six of the fifteen WTGs would be within that portion of the WSA recommended as non-suitable, together with approximately one mile of underground transmission cable and two miles of new roads. The turbines would be located on a ridge to the west of Whitewater Canyon in Section 27. Construction of the turbines would significantly impair the area's naturalness and the opportunities for solitude and primitive recreation on the ridge, precluding future wilderness consideration.

No turbines have been proposed within the boundaries of the suitable area.

U. S. WINDPOWER

Recreation

The western portion of the Whitewater Canyon area in Section 34 lies within the Whitewater ACEC. However, as this is not an area which receives significant recreation use, little impact is expected. There is no conflict with those ACEC management guidelines dealing with recreation.

Several rows of USW 56-50s would occupy the same parcels of public land as the Pacific Crest Trail in the Whitewater Hill-Windy Point area. The survey route of the PCT runs north to south through Section 14, parallel to the proposed turbine rows. Although the 530-foot spacing between rows would provide ample space for the PCT and its 30-foot easement, the alignment bends east at the south end of the parcel, and must cross at least one of the turbine rows. One or two rows must also be crossed just north of Windy Point. The turbine rows could effectively block the PCT unless access across them were provided. No alternative routings across public lands in that portion of the Pass are available.

The applicant proposes to construct 1850 turbines on approximately 2,400 acres of public lands proposed for inclusion in the proposed Whitewater Park. While use of this land by recreationists would be discouraged, the applicant does not plan to fence the perimeter of the wind parks. Although there would be little to prevent extensive unauthorized use of the sites by recreationists, especially by off-road vehicles and sunbathers in the Whitewater River floodplain, the quality of the recreational experience would be significantly altered. The user would find, in place of the present floodplain, an environment composed of row upon row of regularly-spaced turbines, roads and powerlines, a radically different experience. The effect upon use levels cannot be predicted, however. Therefore the degree to which the desired purpose of this portion of the park -- maintenance of current recreational uses -- can be met is unknown.

Wilderness

Over 200 acres of Phase I (Whitewater Canyon) would be within that portion of the Whitewater WSA recommended as non-suitable. This would be an extremely dense grouping of turbines. As a result, there would be a complete loss of the naturalness of this area, eliminating opportunities for primitive recreation or solitude. Future designation as wilderness would be precluded.

No turbines have been proposed for construction within that portion of the WSA recommended as suitable for wilderness designation.

Grazing

During Phase II, three turbines would be sited within the Whitewater grazing allotment, on Alta Mesa. Grazing would not be significantly affected.

SOUTHERN CALIFORNIA EDISON

Boeing

Recreation

The WTGs and access roads would be located adjacent to the surveyed route of the Pacific Crest Trail on the only public lands reasonably available for use as a route across the San Geronio Pass. As only five turbines would be built, the wind park and the trail would not necessarily conflict.

The turbines would be located within the proposed Whitewater Regional Park in a popular ORV and sunbathing area. Only a small area, about six acres, would be permanently occupied. However, one of the purposes of Park designation, to preserve a "natural" feel for the Pacific Crest Trail, would no longer be attainable.

Bear Sterns/Bendix

Recreation

Three of the Bendix turbines would be within the Whitewater ACEC. Their primary impact would be on the Pacific Crest Trail, as described below.

The turbines would be adjacent to a one-mile stretch of the Pacific Crest Trail's surveyed route, although they would apparently be well set-back. The proposed access road would be well to the east of the existing gravel road on the east crest of Whitewater Canyon, which is itself outside of the proposed 30-foot PCT easement. The turbines would be strikingly visible from the trail, however, this area is already crossed by numerous transmission lines. The turbines, while very dramatic, would probably have little effect on trail use.

Although outside of the proposed Whitewater Park, the turbines would be quite visible from Whitewater Canyon. This would interfere with the park's goal of preserving the Canyon's natural qualities.

WECS Tech

Recreation

No impacts are anticipated.

Westinghouse

Recreation

This wind park would occupy an area of 500 acres within the proposed Whitewater Park. Access within the Park could be curtailed if a dike or rip-rap structure was used to protect the site from flooding. Within the area, the "feel" of the Park would be greatly altered by the dense rows of turbines and access roads. Approximately 17 acres would be permanently occupied by roads and fenced facilities. Although the presence of the turbines and the potential for turbine accidents may increase safety hazards, such increased dangers are expected to be slight.

Ventus

Recreation

The entire 1,190 acre wind park would be fenced. This would result in the loss of a popular ORV and sunbathing area in the heart of the proposed Whitewater Park. This represents approximately one-sixth of the entire proposed park region between Highways 111 and I-10. It would also establish a two-mile northwest to southeast barrier to movement across the Park.

PANAERO

Recreation

Several rows of wind turbines would run along approximately three to four miles of the northwest boundary of the Whitewater ACEC. However, it is unlikely that these turbines would have any significant impact on recreation as this is a region receiving little recreation use. There would be no conflict with the ACEC's recreation-oriented management guidelines.

The surveyed route of the Pacific Crest Trail parallels the north-south running rows of wind turbines in Facility II below Whitewater Canyon in Section 14. The PCT would cross the eastern row of turbines in the

southern portion of the parcel, and then cross one or two additional rows on the parcel of public land just to the north of Windy Point. The wide spacing between rows would allow ample room for the FCT and its 30-foot easement; the only conflict would come where the alignment actually crossed a turbine row. These rows would be much less densely occupied than those for the U.S. Windpower proposal (see above) but an easement crossing the rows would be necessary for the same reasons. Although this portion of the trail is already heavily influenced by the presence of man's activities, the turbines would nevertheless add significantly to the "managed" feel of the area.

In the whitewater floodplain between Garnet Hill and Windy Point, 169 machines and 6.6 miles of roads and overhead transmission lines would be constructed as part of Facility I. This area, a part of the proposed Whitewater Park, is heavily used by ORVs and sunbathers. Although only the machines and facilities would be fenced, the "feel" of the area would be changed completely. Machines and transmission lines would dominate the recreation experience. However, only minor access restrictions would be imposed, and the mere presence of the machines would not necessarily reduce recreation use.

Just below and to the north of Windy Point is a popular ORV/ATV play area. This area would be occupied by twenty medium-sized machines. Together with their associated overhead transmission lines, the machines would effectively break up this area, although recreation use would not be prohibited. Eight acres would be permanently occupied by roads and turbines. Other impacts on this parcel and on lands just to the northwest in Section 14 would be as described above for Facility I.

Facilities three and four would be constructed in the region west and north of Edom Hill now used as an unofficial ORV play area. Forty-four acres would be occupied by the turbines and related facilities. Impacts would be similar to those described for Facility I above.

Wilderness

Approximately ten two-megawatt and twenty-five 500 kw machines would be constructed during Facility II in the non-suitable portion of the Whitewater WSA. These would significantly degrade the naturalness of the area, and would eliminate any opportunities for solitude or primitive recreation. Over half of the non-suitable area would be affected. Future designation as wilderness would be precluded. In addition, the applicant has proposed the construction of approximately four two-megawatt and eight 500 kw machines as part of Facility II within that portion of the WSA recommended as suitable for wilderness designation. No development would be allowed in this area.

SAN GORGONIO FARMS

No popular recreation areas lie within the region proposed for development by the applicant. Accordingly, no significant impacts are anticipated.

CITY OF RIVERSIDE

Five MGD-2s would be constructed within the Whitewater ACEC, in the southern portion of Section 34. As this is an area receiving little recreation use, no significant impacts are anticipated. None of the recreation guidelines for the ACEC would be involved.

No other significant impacts are anticipated.

SMART

Some use of Windy Point by GRVs presently occurs. Construction of the turbines could inhibit use of the hill, although only five acres would be fenced and removed from public access. Construction may also interfere with use of the Pacific Crest Trail which runs across the north base of the hill. No other significant impacts are anticipated.

VISUAL RESOURCES

GENERAL DISCUSSION

Wind turbine development is assessed in terms of its impact on (1) visual contrast and dominance and (2) effects on visual resource quality. The basic assumption(s) used in the analysis, and the assessment methodology are described in Appendix H.

The wind turbine development in the study area will have a significant visual impact on the existing landscape character. Generally impacts would result from removal of vegetation and soil disturbances associated with construction of wind tower pads, access and service roads, electrical transmission lines and introduction of a variety of wind turbine structures.

The following assessment summarizes the effects of various wind turbine developments for each alternative by proposal and does not compare one proposal against another.

Related Visual Resource Issues, i.e., wilderness, recreation, and Native American concerns are discussed in appropriate resource analysis sections.

WINDFARMS

Phase I

Phase I would be located in a visual Class III area along the eastern edge of Whitewater Canyon. Development would be visible but not dominant under average lighting conditions from the Desert Hot Springs area, Interstate 10 traveling west (Figure 4-5) towards Garnet Hill, Windy Point area viewing north from Route 111 (Figure 4-6) and within the Whitewater Canyon area adjacent to the site. Because the site is generally backdropped it would not be highly visible from major travel routes to and from the Palm Springs area. Certain extreme lighting conditions during the early morning or late evening, however, may make the area highly visible for those periods of the day.

Since the applicant proposes using existing roads only, minimum impact would result due to upgrading the existing road system.

Surface disturbance resulting from the construction and operation of the wind turbines would alter the line, color and texture of the landscape to a moderate or strong degree, depending on the location of the pads. The strongest impacts would occur towards the northern end of the project area due to the rectilinear forms of the pads and cuts on steeper slopes.

Because of their size, the wind turbines would create the greatest impact, completely dwarfing other man-made structures in the area. Although the area has a number of transmission towers and wood pole lines, they are essentially transparent (unless silhouetted against the skyline), and are small in scale. It is assumed that in the worst case the wind turbines would be painted white with FAA color markings and, combined with their large scale would create moderate to strong visual impacts in the form of large tubular non-transparent masses compounded with tall vertical lines accenuated by color. The motion of the large blades would also attract attention. The structures would dominate the landscape, particularly those turbines on the northern end of the site and adjacent to Whitewater Hill. Development would add to impairment of the quality of the visual resource.

Phase II

This portion of the proposal is located in both visual Class II (Sections 27 and 34) and Class III (Alta Mesa) Management Areas. The site is highly visible from the north Whitewater Canyon area and from areas east of Whitewater Hill and Windy Point (Figures 4-5 and 4-6). The area would also be more visible from residential areas on the northern portion of Palm Springs.

The grading and construction of access roads including underground electrical transmission systems would have a moderate effect on visual contrast. Most of the access development would be new construction except for a one mile section, which is not highly visible, near the communications site on the western side of Whitewater Canyon. Color and line contrasts would result from cuts and fills on side slopes and removal of vegetation. The greatest impact would occur from the end of the existing road to the northern limits of the project area, which is more visible from the eastern edge of Whitewater Canyon and the PCT trail.

Surface disturbance required for construction and operation of the wind turbines would alter the line and texture contrast of the vegetative pattern and expose the soil color depending on the location of the pads. More severe impacts would occur towards the northern end of the North Whitewater area where steep slopes would accentuate the rectilinear and regular form of the base pad.

The color markings of the wind turbines combined with their large scale would create moderate to strong visual impacts. The southern-most turbines would be more "sky-lined" in the Alta Mesa area and would be visible from Interstate 10 because of their height and position in the landscape. Impacts would be more severe in Sections 27 and 34 than on Alta Mesa.

Phase III

This portion of the proposal is in visual Class II (Devils Garden) and Class III (Whitewater Hill) management areas. The Devils Garden site is highly visible to travelers going east on Interstate 10, Route 62 and from Desert Hot Springs. The site is generally backdropped but does not exhibit any visible man-made conditions (Figure 4-5). The area immediately northwest of Whitewater Hill is visible from Desert Hot Springs but is "screened" by Whitewater Hill from other viewing areas (Figure 4-6). Not until one moved closer to the Painted Hill area would development become more visible.

The grading and construction of access roads would have moderate to strong effect on the visual contrast of these areas. Most of the road development in the Devils Garden would be new construction except for the first mile. Color and line contrasts would result from cuts and fills on steep slopes (over 25 percent) and removal of vegetation in this relatively undeveloped area. Depending on the location, side casting would create strong color and line contrasts. Drainage structures would cause moderate to weak line and color contrasts depending on the extent and the size used to reduce soil erosion.

Upgrading existing roads near Whitewater Hill would have less impact than road construction in Devils Garden Area since the area is relatively less steep and is traversed by a number of existing roads.

Surface disturbance required for construction and operation of the wind turbines would alter the vegetative pattern and expose the soil color, creating moderate to severe contrasts. The more severe impacts would occur in the Devils Garden Area. Here cuts and fills would be accentuated by steeper slopes. Whitewater Hill is relatively flat to rolling and would have only moderate impacts associated with pad construction.

Construction of the wind turbines would create moderately strong visual impacts in the form of large tubular, non-transparent masses compounded with tall vertical line(s) accentuated by color and motion. The greatest impacts would occur in the Devils Garden area as this area is relatively undeveloped while Whitewater Hill has a number of transmission towers in the area, which are generally transparent dull colored structures unless silhouetted against the skyline.

There would be an additional impact associated with the overhead transmission system near Devils Garden. The moderate contrasts would result due to disturbance of the soil surface and the vertical line and color of steel transmission structures.

As proposed Phase III would dominate the landscape and have a negative effect on the quality of the existing visual resource.

Phase IV

This portion of the proposal would be located in a visual Class III management area. The area is generally visible from all areas in the study area if the viewer is in a superior viewing position (Figure 4-4). However, only the turbines would be visible from normal or inferior viewing positions because of the existing railroad windbreaks and other natural

and man-made elements in the landscape. The grading and construction of access roads in the wind-blown sand area would have some moderate effect on contrast but would still meet VRM objectives. There are a number of man-made linear elements in the landscape including roads, railroad tracks, wind breaks and drainage and flood control systems. However, some color and line contrasts would still result from vegetation removal and introduction of additional regular linear forms to a relatively flat uniform surface.

The surface disturbances required for construction and operation of the wind turbines would alter the line, color and to a certain degree the texture of the characteristic landscape. The relative degree of contrast would be moderate. These impacts are similar to the impacts associated with road construction. Some form of stabilization may be required in the form of rip-rap and/or plantings although it is not addressed in the proposal. This would create additional moderate color, line and textural contrasts.

The wind turbines would dominate other structures in the landscape, including freeways, bridges, transmission towers and pole lines, railroad facilities, urban development, and billboards. As proposed, the wind turbine structures would be painted white with FAA color markings. This combined with their large scale would create moderate to strong visual impacts. The overall effect of the development would be moderately strong on the visual resource.

U.S. WINDPOWER

Phase I

This proposal overlaps two visual class management areas, Class II (Sections 33 and 34) and Class III (Alta Mesa). The construction of access roads and overhead electrical transmission systems would have a moderate to strong impact on both areas. The majority of the roads would be new except for an existing access road in the canyon north of Alta Mesa. Line and color contrasts would result from cuts and fills on the steeper slope to the north of Alta Mesa and on the southern rim of the Mesa. Vegetation removal would create additional line and color contrasts in both areas. Although the areas have a natural tendency to "heal," the increased density of access and service roads would create a definite long-term scarring in the characteristic landscape. This would be very evident since both areas are highly visible from Interstate 10 and Route 111 from the upper end of Whitewater Canyon and from the PCT Trail.

The surface disturbance required for construction and operation of the wind turbines would create moderately strong line and textural contrasts depending on the location of the WTGs. This would be due to exposure of the soil and disturbance of the vegetative mosaic during construction. The more severe impacts would occur in Sections 33 and 34 and the southern portion of Alta Mesa (areas of less steeper slopes on the Mesa and in the southeastern portion of Sections 33 and 34 would have slightly less impact than the other areas) which are highly visible from Interstate 10 and the surrounding environs (Figures 4-7 and 4-8).

The wind turbines would create the greatest impacts. Although these turbines are lower in height than the larger machines, the density of wind turbines would create strong contrasts in both areas due to the effect of disorder in the relatively undeveloped landscape. The area is highly visible, particularly on the steeper slopes of Alta Mesa and from any number of viewing positions in the study area.

The construction of an overhead transmission system would create additional impacts only slightly less than for the wind turbines. Line and color contrasts would result from the transmission structures, particularly Sections 33 and 34. The overall effect of development would be to dominate and have a strong negative effect on visual resource quality.

Phase II

This portion is in a visual Class III management area. There are a number of man-made linear elements in this area including roads, railroad tracks, drainage/flood control systems and transmission towers. However the grading and construction of access and service roads would create additional moderate contrasts in the characteristic landscape. Color and line contrasts would result from vegetation removal and introduction of additional linear forms. There would also be additional line and color contrast related to drainage and protection/stabilization structures in the wash areas. The surface disturbance required for construction and operation of the wind turbines would result in impacts similar to those resulting from access and service road construction.

The density of machines would create strong contrasts in the "wash" and Whitewater Hill areas. Overhead transmission pole structures and ROW preparation would add to the overall clutter effect of the wind turbine structures. The area is also highly visible from Interstate 10 and Route 111 and the areas to the east including Desert Hot Springs and North Palm Springs (Figure 4-8). Therefore there would be an overall negative effect on the visual resource.

Phase III

This portion of the proposal is in a visual Class III management area. The area is highly visible from superior viewing positions (Figure 4-7) in the study area and residential areas in north Palm Springs and Route 111. Ground level and/or inferior Route 111 viewing situations would be interrupted from Interstate 10 traveling west because of railroad windbreaks and other features in the characteristic landscape. However, travelers driving east will be exposed to fuller views of development. Although there are already a number of man-made linear elements in the landscape including roads, railroad tracks and wind breaks, and drainage/flood control systems, the overall density of access and service roads would have a moderately strong impact on the area. Color and line contrasts would result from some vegetation removal and introduction of linear forms. There could also be additional line and color contrasts related to drainage and stabilization structures. Site disturbances related to wind turbine construction would be similar to those of access and service roads.

The siting of wind turbines would create the greatest impact. These facilities would cover nearly three sections of public lands and would literally form solid masses of turbines. When viewed from residential

areas, Interstate 10 and Indian Road, the form, line, color and textural contrasts would create a very strong clutter effect (Figure 4-8). The density of pole structures for overhead electric transmission systems would also contribute additional visual impacts particularly to the clutter effect of the wind turbines. The facility as proposed would not meet the visual objectives of the area.

SOUTHERN CALIFORNIA EDISON

Boeing

This proposal would be located in a visual Class III management area. Development would be visible, but not dominant, from Interstate 10 traveling west towards Garnet Hill (Figure 4-9), the Windy Point area viewed north from Route 111 (Figure 4-10) and within the Whitewater Canyon area adjacent to the site. The site would not be highly visible when traveling east on Interstate 10 or Route 111 and/or from Palm Springs except for the Painted Hill area. Access roads would create moderately low color and line contrasts in the characteristic landscape. The surface disturbance required for construction and operation of wind turbines would create similar impacts as described in Windfarms Phase I.

The machines would be massive in relation to other structures in the area and create the greatest impacts. Even though there are a number of disturbances in the area the turbines would dominate the landscape, creating strong visual contrasts.

Bear Sterns/Bendix

This proposal is in a visual Class III management area. The area is highly visible from Interstate 10 and Route 111 and from superior viewing positions towards the east of the Pass (Figures 4-9 and 4-10). A moderate to strong impact on color and line contrast would result from soil disturbance and vegetation removal caused by the construction of access roads. The surface disturbances required for construction and operation of the wind turbines would similarly alter the line, color and to a certain degree the texture of the characteristic landscape.

More severe impacts would occur from pad construction towards the northern end of the project area due to the form of the pads being accentuated by steeper slopes.

A number of transmission towers and wood pole lines are located in the area, however, they are generally not evident in the landscape, unless they are silhouetted against the skyline and/or are small in scale. The Bear Sterns/Bendix machine is a relatively large structure, dwarfing other man-made structures in the study area. As proposed these structures would have FAA markings. This combined with their large scale would create moderately strong visual impacts in the form of large tubular non-transparent masses compounded by color and motion. The structures would also dominate the landscape and negatively effect the overall visual resource quality of this area.

WECS Tech

This proposal is in a visual Class III management area. The area in and around Whitewater Hill is generally visible from any position in the landscape except for a limited area just north and east of the hill (Figure 4-10). The development of service roads would create moderate contrasts in the characteristic landscape and would just meet the visual contrast objective for the area since the immediate site is crossed by a number of existing roads. The surface disturbance required for construction and operation of the wind turbines would create similar impacts.

The wind turbines would create the greatest impacts. Although this turbine type is smaller in scale than larger wind machines, the density of the machines would create strong "clutter" or textural contrasts. The strong color, line and textural contrasts are compounded by the density of machines on a highly visible landmark, particularly noticeable traveling east on Route 111 where WTGs on the site would be skylined.

Westinghouse and Ventus

This proposal is in a visual Class III management area (see descriptions of visibility for Windpower - Phase III). The density of access roads required to construct and service the wind turbine generators would have a moderately strong impact. Color and line contrasts would result from some vegetation removal and introduction of linear forms. Site disturbances related to wind turbine construction would be similar to those of access or service roads.

The siting of wind turbines would create strong visual contrasts in the wash (Figure 4-9). This facility would cover nearly three sections of public lands and form a solid mass of turbines. When viewed from residential areas and major routes of travel the form, line, color and textural contrasts would create strong clutter and disorder.

PANAERO CORPORATION

Facility I

This portion of the proposal is in a visual Class III management area (see descriptions of visibility for U.S. Windpower Phase III). The grading and construction of access roads would have some moderate visual contrast within the generally uniform wash plain. Color and line contrasts would result from vegetation removal and introduction of additional linear forms. There would also be additional line and color contrasts related to possible drainage structures (Figure 4-11).

Similarly, the surface disturbance due to pad construction and operation would result in moderate contrasts to line, color and to a certain extent the texture of the characteristic landscape. Although it is not addressed in the proposal flood proofing (dikes) may be required which would create additional color, line and textural contrasts.

The most significant visual impact resulting from this proposal would be the mixture and type of wind turbines proposed for use: the Hamilton Standard WTS-4, the Westinghouse WWG-0500 and the DAF Indal. Each machine

is distinct in its appearance. Their combined visual contrast would have a moderate to strong impact on the characteristic landscape and would not meet the visual objectives for this area. This is due to the clutter and disorder effect created by the mixture of forms, line, color and texture of the three different structures. In the foreground this clutter effect would increase and would be somewhat greater than similar uniform rows of either larger or smaller machines.

Even though there are a number of pole lines in this area the addition of a large number of pole structures would create significant visual impacts compounded by the clutter effect of the wind turbines. The facility would dominate and have a moderately negative effect on the visual resource.

Facility II

The parcels north of Windy Point and in Section 14 are in a visual Class III management area. The area is highly visible from Interstate 10 and Route 111 in the Windy Point area (Figure 4-11).

Even though there are a number of man-made linear elements in this area including roads, railroad tracks and drainage/flood control systems the grading and construction of access roads would create moderate contrasts in the landscape. Color and line contrasts would result from some vegetation removal and introduction of additional linear forms and lines of right angles to the direction of the landscape. Similarly, the surface disturbance from pad construction and operation would result in moderate contrasts to the line, color, and to a certain extent the texture of the characteristic landscape.

A significant impact would result from the mixture of wind turbines proposed for this site. Their combined visual contrast would have a moderate to strong impact on the landscape due to the clutter effect created by the mixture of form, line, color and textures of the three different wind turbines. This effect would be the strongest from Route 111, in the foreground, looking through and down on the proposed development. Overhead transmission systems would create additional significant vertical line and color contrasts.

The remainder of Facility II is divided into two visual class management areas. The areas north of Alta Mesa and near Cabazon are in Class II and that of Alta Mesa is in Class III.

The grading and construction of access roads would have strong impacts on the characteristic landscape north of Alta Mesa and moderate contrasts in the remaining areas. The area is generally undeveloped except for the low grade way along the western ridge of Whitewater Canyon. Color and line contrasts would result from cuts and fills and removal of vegetation and exposure of soil color. North of Alta Mesa, the proposal would require extensive new road development, particularly for the western side of the area and the more visible sections along Whitewater Canyon.

Impacts would be moderately strong on Alta Mesa due to vegetation removal and soil color exposure. These contrasts increase towards the southern portions of the area due to steeper slopes and more unstable soil conditions.

Near Cabazon the impacts would be moderately strong due to vegetation and soil color exposure and because the area is within the immediate foreground of Interstate 10.

Similarly, the surface disturbance required for construction and operation would create moderately strong contrasts. Severe impacts would occur to the west and north of Alta Mesa and to the southern portion of Alta Mesa. These impacts would occur as rectilinear forms (pads) which are accentuated by the cuts and fills on steeper slopes.

The siting of wind turbines would have the most significant impact on the two areas. Class II areas are devoid of structures except for a microwave repeater station. The form, line, color and texture contrasts would be strong due to the different machine types and the greater degree of clutter. The degree of impact would be slightly less only because there are towers on the southern boundary area.

Construction near Cabazon would create moderate form, line, color and textural contrasts because of the mixture of machine types.

Utilization of overhead transmission systems would create line and color contrasts due to additional pole structures and ROW clearing. This would be most significant north of and along the southern boundary of Alta Mesa.

Facility III and IV

The development proposal would traverse two visual class management areas. Facility IV and the portion of Facility III near Willow Hole (Area A) are in Class III and the remainder of Facility III (Area B) is in Class IV.

There are a number of power line rights-of-way including towers and roads, communication facilities, and off-road vehicle "tracks" in these areas. However, additional road construction would still result in moderate impacts on the landscape due to additional exposure of soil color and straight lines created where vegetation is removed. This is highlighted by the slope and prominent position of Flat Top Mountain and Edom Hill in the landscape. These areas are all highly visible from Interstate 10 and surrounding developed areas (Figure 4-12).

Similarly, the surface disturbance resulting from pad construction and operation would result in moderate contrasts to the line, color, and to a certain extent the texture of the characteristic landscape. The pads would be accentuated by cuts and fills on the steeper slopes and relatively loose soil conditions.

Although the area is criss-crossed by overhead transmission lines the addition of another system would have a noticeable impact. The proposed wind turbines would have a moderate to strong impact on the landscape due to the clutter effect created by the mixture of machine types. The northern portion of Area B would not be as adversely effected as Flat Top Mountain and the southern slopes of Edom Hill because of their prominent position in the landscape.

SAN GORGONIO FARMS

This project is located in a visual Class III management area (see SCE WECS Tech and Windpower Phase II for a description of visibility).

Access and service roads would create moderate contrasts in the landscape and would just meet the visual objective for the overall area since the immediate site is crossed by a number of existing roads. The surface disturbance required for the wind turbines would create similar impacts as described for access or service roads (Figure 4-13).

The wind turbines would create the greatest impact due to their overall density and mixture of tower types. Strong form, line, color and textural contrasts in the landscape would not meet visual objectives for this area. Impacts on Whitewater Hill, a visual landmark, would be accentuated by skylined views particularly from Route 111.

CITY OF RIVERSIDE

This site is located in a visual class management area II (see Windfarms Phase II and PanAero Facility II for description of visibility).

Grading and construction of access and service roads would have moderate effect on visual quality but would still meet visual objectives. Color and line contrasts would occur due to additional cuts and fills and removal of vegetation within the right-of-way (Figure 4-14).

Grading and leveling required for each wind turbine pad would create moderately strong line contrast because of the size of the pads. This would be accentuated by the disturbance of the vegetative mosaic.

Construction of the wind turbines would create the greatest impacts because of the scale and dominance of the MOD-2 turbine structures. Strong visual contrasts would be in the form of large tubular non-transparent masses with tall vertical lines accentuated by color and motion and would not meet VRM objectives. Several of the machines would be skylined from the Whitewater Canyon area and towards the east and southeast depending on the viewing angle and position.

SMART

Windy Point is in a Class II visual management area and is a significant visual landmark in the region. The landmark is highly visible from most parts of the study area (Figure 4-15).

Access and service roads would create strong form, line and color contrasts due to cuts and fills required for construction in steep rocky terrain and would not meet VRM objectives for the area. Construction of wind turbine pads would require extensive cutting and filling and would result in contrast levels similar to those from access and service roads.

The prominent location of the wind turbines in the landscape would create strong form, line and color contrasts, would dominate the area and have a strong negative effect on over-all visual resource quality.

GEOTECHNICAL CONSIDERATIONS

Potential geologic and seismic hazards are discussed in the San Geronio Wind Resource Study, EIR/EIS (March 1982) analysis of Scenario II. Using the geotechnical categorization of areas developed in Section III.D, the significance of these potential hazards for sites and facilities is identified in Table 4-1. Some potential hazards in addition to those discussed in the generic EIR/EIS (March 1982) are identified and discussed below. The hazards identified in Table 4-1 are those which could have a reasonable probability of occurring in the study area. Some of these potential hazards were determined to be insignificant because they would be neither probable enough nor severe enough to require special mitigation measures and are not further considered. Comparison of Tables 3-1 and 4-1 indicates the types of hazards which could occur at each proposed site.

SUPPLEMENTARY DESCRIPTION OF GEOLOGIC HAZARDS

Large boulders in the Whitewater River alluvial fan (Category II area) indicate that either mudflows or very forceful stream flows debouch onto the fan. Such flows could cause extensive damage by direct impact of water and sediment on any facilities sited in this area. In addition, if deposits resulted from stream flows, a great depth of scour could be expected around impediments (such as foundations or utility trenches).

Areas in and downwind from the alluvial fan (Category II) and flood plain (Category III) of the Whitewater River are classic areas for the scientific study of wind-driven sand. Generally, a blanket of wind-driven sand moves within a few (10-20) feet of the ground, and the greatest abrasion occurs close to the ground. Sand blasting could damage inadequately protected equipment mounted within a few feet of the ground and could reduce the size and strength of exposed structural members below their intended design values.

Depending on seasonal conditions, airborne silt may be carried much higher than the sand. Such silt is extremely intrusive. It may lodge within inadequately sealed moving parts, resulting in accelerated wear and mechanical breakdown.

Finally, the installation and (particularly) operation of the proposed facilities in these areas will alter natural air flow patterns. This may cause locally significant erosion or deposition of loose sandy deposits as well as "launching" sand particles to unusual heights. All of these changes may adversely affect service roads, buildings, transmission lines and the wind turbines themselves, as well as the offsite (downwind) environment.

EROSION

Upland and Terrace Sites, particularly those on the Badland Soil series, will be highly vulnerable to water erosion. Because of the shallow soil mantle and inherently low fertility these soils will not tolerate much abuse without yielding large amounts of sediment.

Wind and water erosion are likely to attend the construction of wind farms located within the Whitewater River and Mission Creek drainages. Turbine foundations constructed in the floodway will result in increased wind and

TABLE 4-1

SIGNIFICANCE OF POTENTIAL HAZARDS IN CATEGORIZED AREAS

Potential Hazard	Category I*	Category II**	Category III***
Fault Rupture	Significant (a)(b)	Insignificant	Insignificant
Earthquake Ground Shaking	Significant (a)(b)	Significant (a)(b)	Significant (a)(b)
Liquefaction	Insignificant	Insignificant (it is assumed that the sedimentary material is too coarse grained)	Unresolved
Differential Compaction/ Seismic Settlement	Insignificant	Unresolved	Unresolved
Landsliding	Significant (a)	Insignificant	Insignificant
Mudflow	Insignificant (a)	Significant (a)(b)	Insignificant
Unstable Cut and Fill Slopes	Significant (a)	Insignificant	Insignificant
Collapseable or Expansive Soils	Insignificant	Insignificant	Insignificant
Flood	Insignificant	Significant (see Hydrology section)	Significant (see Hydrology section)
Erosion by Water	Significant (a)	Significant (a)(b)	Significant (a)
Eolian Deflation or Deposition	Insignificant	Significant (a)	Significant (a)
Sandblasting by Blowing Sand	Insignificant	Significant (a)	Significant (a)
Airborne Silt in Mechanism	Insignificant	Significant (a)	Significant (a)

*Category I: Upland areas in or adjacent to the San Geronio/Coachella Valley area.

(a) Moderate-to-high probability of occurrence

**Category II: Active alluvial fan at mouth of Whitewater Canyon.

(b) Moderate-to-high severity

***Category III: Relatively flat areas of the Whitewater River flood plain in Coachella Valley.

water turbulence, which in turn will scour soil from around the foundations. Foundation placement and road construction would destroy desert crust and erosion pavement, rendering the exposed soil surface vulnerable to accelerated wind erosion.

HYDROLOGY

During flooding conditions, erosion and/or deposition may occur in the same general area. The degree of severity of erosion or deposition changes with the amount and intensity of rainfall, and changes to topography.

Installing wind farms within the Whitewater floodplain could worsen flood hazard, erosion and downstream sediment deposition. Implementing measures to control flooding, erosion, and sediment transport would be a necessary adjunct to wind farm development in order to mitigate adverse impacts.

SEDIMENTATION

The dislodgement and transport of soil and rock particles by wind or water is referred to as sedimentation or deposition. Basically, deposition occurs in areas where the water or wind loses velocity. Decreases in water velocity may be produced by a lessening of slope, an increase in the areal extent or spread of waters, obstructions, decreases in fluid volume, and a sudden large increase in sediment load. Deposition of wind transported materials occurs primarily where velocity is reduced under similar circumstances as for water. Velocity and turbulence vary with terrain and physical obstructions. Deposition of wind or water-borne sediments often occur in depressed areas on the land surface.

Sedimentation generally occurs when flood waters lose velocity. Sites located within the Mission Creek drainage would be susceptible to sedimentation if located near major changes in topography. The area of the Whitewater River floodplain southeast of Windy Point has a high potential for sedimentation, since the flood waters from Whitewater Canyon undergo a drastic change in velocity where they intersect and converge with the San Geronio River.

FLOODING

Changing the normal course of flowing water may produce flooding. Natural channels offer the path of least resistance for flowing water. Structures placed in areas subject to sheet flow tend to divert the water around either side of the structure eroding the soil as it passes. Extensive development in the Whitewater River and Mission Creek floodplains would change many natural drainage courses. Rechanneling and protecting existing channels would be necessary to prevent erosion.

OTHER HYDROLOGIC CONSIDERATIONS

Unprotected Drainage Courses. Drainage courses are constructed to divert flow away from vulnerable areas or to confine it in preferred courses. Unprotected drainage ways are vulnerable to erosion in the form of channel scouring and stream bank failure due to undercutting. Extensive damage from scour and undercutting should be anticipated along the Whitewater River and Mission Creek during periods of intense rainfall and high streamflow.

Increased Impervious Surfaces. Man-made structures and pavement for roads decrease the area in the watershed available for absorbing rainfall and sheet flow, and, thereby, increase the likelihood of flooding. Generally, the impervious areas connected with wind turbine development are less than those created by residential or commercial development. Still, the overall loss of pervious land could adversely impact local infiltration and percolation rates. As much as one-third of the proposed siting areas could be replaced with impervious surfaces.

Land Subsidence. Subsidence is the lowering or depressing of the land surface defined by processes other than the application of surface load, or excavation of earth materials. Subsidence may be instantaneous and violent or gradual and may be caused by natural forces or by the activities of man. It is generally caused by solution and collapse of underlying soluble deposits, rearrangement of particles due to the removal of coal, or reduction of fluid pressures within an aquifer or petroleum reservoir.

Wind development in and by itself should not depress groundwater elevations nor adversely decrease water supplies.

Hydroconsolidation. Usually, sediments laid down by stream or floodwater deposition are fairly tight and hard, but in some cases, the material is loose, soft, and unconsolidated. This type of material, at the surface or below the surface, when subjected to saturation by surface or ground waters may consolidate because of a decrease in the shearing strength and cohesion of the mass.

The potential for extensive development of areas now in the natural state could greatly increase the possibility of hydroconsolidation of materials normally not subjected to saturation and stress.

FLOOD CONTROL

Proposed sites within the floodplains of the Whitewater River and Morongo Wash are vulnerable to flooding. According to the Coachella Water District Flood Control, the Whitewater River Channel, west of Indian Avenue, generally rises between two and three feet during a flood. Comparable depths could probably be expected through the Morongo Wash east of Garnett Hill and Interstate Highway 10.

Local flood control agencies would be concerned about constructing impervious structures in existing flood control channels and water-spreading grounds. Constructing foundations, dikes and roads could change existing flow patterns resulting in increased runoff, erosion, debris deposition and flood buildup downstream.

To prevent the obstruction of floodways, Riverside County regulates development in accordance with County Ordinance 458. Section 6a states:

"No structure shall be constructed, located or substantially improved and no land shall be graded or developed in the areas designated as floodways, except upon approval of a plan which provides that the proposed development will not result in any increase in flood levels during the occurrence of the base flood discharge. If a proposed permit qualifies for approval

in the floodway, it shall then meet all the requirements necessary for approval for a permit in the floodplain areas."

BIOLOGICAL RESOURCES

GENERAL IMPACTS

Biological resources can be affected by many stages of wind energy development, including initial materials acquisition and processing, turbine production and assembly, turbine installation and operation, and final turbine decommission (Energy and Environmental Analysis 1980, Lawrence and Strojan 1980, Meier and Merson 1980). There are also many possible effects from support activities, such as road building to provide access to the turbine sites, development of electric feeder and transmission lines, and construction and maintenance of substations.

The direct impacts of wind energy development on biological resources include two main categories: 1) loss of animals through surface disturbance at turbine sites, in road rights-of-way, along power line rights-of-way, and at substation sites, and 2) disturbance of animal behavior through interference with courtship, rearing of young, feeding, and other necessary aspects of animal life histories. Generally, wildlife activity would decrease significantly in the immediate construction area or facility site, and animal territories near the development will often be deserted, at least temporarily.

If associated long-term indirect impacts are high, developed areas may be abandoned permanently. Such indirect impacts include immediate habitat loss as well as long-term cumulative habitat deterioration. Immediate habitat loss due to wind energy development would come during construction of turbines, roads, substations, and power distribution and transmission lines. Other indirect impacts include increased human activity, noise, and visual disturbance, and subtle habitat changes, such as "windbreak" effects on aeolian sand transport and deposition and invasion of Russian thistle to disturbance areas.

Vegetation

For significant impacts to major habitat areas see sections on ACECs, riparian areas, and sand dune habitat. No maps or data were available on the distribution of creosote bush scrub, and mountainous and wash habitat types; thus, no comments are made here.

Two species of concern, Linanthus maculatus and Astragalus lentiginosus var. coachellae, occur within or immediately adjacent to the areas proposed for development, and a third, Euphorbia platysperma, has potential habitat (see Map 3-5 and Appendix I). Information is lacking on distribution, life history requirements, and responses to disturbances. Most rare plants are susceptible and negatively affected by disturbance, but a few are adapted to natural disturbances that regularly occur in their environments. Two species, A. l. coachellae and E. platysperma, may require windblown sand environments and thus may be affected by any changes in the natural sand transport and deposition systems in the Coachella Valley (see also CVFTL discussion). At this time it is not possible to state whether wind energy development would have positive or negative impacts.

Wildlife

Effects on wildlife from wind turbine development can occur directly or indirectly. An example of the former would be collision hazards to birds presented by the twirling windmill blades or associated electric lines, while an indirect effect would be loss of habitat sufficient to diminish the survivability of individuals, populations, or even an entire species.

Migratory Birds

The possibility of bird kills resulting from collisions with wind turbines has been raised as a potentially significant issue (U.S. Department of Energy 1978a, 1978b; Kornreich and Kotler 1979; California Energy Commission 1980), but almost no data exists to substantiate this concern. The concern appears to have evolved from problems encountered with the operation of tall transmitting towers and airport ceilometers, where bird kills of several thousand individuals per night have been recorded (Avery and Crawford 1981, Avery et al. 1978). The most severe bird kills have been observed along migratory pathways on overcast nights, and collisions may be increased by lights on the towers that disorient the birds. As San Geronio Pass and Morongo Valley lie along bird migration routes, there is concern about how wind energy development in the area will affect migratory birds (Bureau of Land Management 1981).

The potential for collisions between birds and wind turbines depends on several factors: rotor and tower design, the number of birds flying through the area, whether evasive action is taken by the birds, weather conditions, total structure height, and, possibly, whether the structure is lit. Field observations and experiments were conducted at the 100-km MGL-0 wind turbine in Sandusky, Ohio, to assess the potential for birds and insects to collide with the turbine (Rogers et al. 1977). During four migratory seasons of searching for tower-killed birds, one nocturnal migrant was found near the base of a nearby meteorological tower. This study was done in an area where spring and fall migration averaged about 5,300 birds per mile of front per hour and was as high as 17,000 birds per mile of front per hour (Rogers et al. 1977). In the San Geronio Pass the average migratory rate during spring migration was slightly over 3,000 birds per mile of front per hour, with a peak of 22,800 per hour (McCrary et al. 1981).

Data on bird collisions with stationary man-made structures (see Avery et al. 1978 for an annotated bibliography) are not directly analogous or applicable to WTs. WTs have both visual and noise aspects that television antenna towers, lighthouses, electric transmission lines, etc., usually do not have. Blade movement can be seen and heard on clear days, but at night or in foggy weather visual detection of man-made objects by birds is diminished. Noise made by turning blades may be more detectable at night because of generally lower ambient noise levels or in foggy weather because of the physical qualities of sound transmission at high humidity. Rogers et al. (1977) reported that migrating birds were observed to take evasive action to avoid WT blades at night. They add that "the birds will avoid the turbine if they can see it."

Thus, while data collected to date indicate a very low incident rate of bird/WT collisions (Windfarms, Ltd. 1982; Rogers et al. 1977), the number of WTs studied remains very small. Also, the effects of a grouping of WTs are yet unknown.

None of the studies conducted to date clarify the bird migration situation sufficiently to judge in any quantitative way the relative merit of the wind energy proposals. Sufficient data is lacking on fall nocturnal migration numbers and patterns, altitude of bird migrations through the area during both spring and fall, actual bird kill rates from existing WTs, and the effects of weather and topography on migratory behavior. It can be said, however, that wind turbines with guy wires pose a greater threat to birds than those without because of the increase in the size of the potential collision zone and the fact that it is difficult for the birds to see and avoid the wires.

Studies to fill data needs have been proposed (Schreiber et al. 1982) and funded. However, speculations concerning bird mortalities by species, the percentage of each migratory population being destroyed, and the significance of those mortalities to the species in question are premature. As stated by McCrary et al. (1981), "the possible environmental hazards of WTG's are almost unknown."

The studies to be conducted by Schreiber et al. (1982) in 1982 will include both spring and fall study of nocturnal bird migration using a short-range, high-resolution radar system which will give actual altitudes and spatial distribution of migrating birds in and around the San Geronio Pass and Coachella Valley. Two sites have also been chosen for collision mortality studies; one is the existing Devers WTG site which also has a transmission line tower nearby, and the other is a 300-foot meteorological tower near Whitewater Canyon. Also, a spring-fall analysis of weather data will be combined with nocturnal bird migration data to better elucidate the effects of weather and topography on bird behavior in the study area.

Raptors

The potential danger of collisions with power transmitting structures were described by participants of a workshop on Impacts of Transmission Lines on birds in Flight (Avery 1978:106) as follows:

"Raptors that actively pursue prey in flight are probably more vulnerable to a collision with transmission lines than those that do not, but factors such as size of bird, wing span, and maneuverability (erratic or straight flight) are also important. The group agreed that when birds pursue prey, engage in courtship flights, defend a territory, or escape from a predator, they are particularly prone to collide with a power line, because they are preoccupied and not very alert to the hazards that transmission lines pose."

It is not difficult to extend this logic to possible raptor collisions with WTs extending almost 400 feet into the air.

The safety of electric distribution (feeder) lines to raptors and other large perching birds must also be considered. Electrocution hazards have been identified in many parts of the Western United States. The tubular steel tangent pole configuration proposed for use by windfarms is raptor-safe, but those shown in other proposals are not (see below). Refer to "Suggested Practices for Raptor Protection on Power Lines" (Glendorff et al. 1981) for the state of the art on this subject.

Another consideration which may impact the behavior of large soaring birds (e.g., hawks and eagles) is the placement of turbines along ridge tops where air currents deflected upward by the terrain are used by the birds as lift. This may be a particular problem on the ridge just east of Whitewater Canyon. Studies to be conducted in 1982 (Schreiber et al. 1982) will shed light on this problem.

Birds of Riparian Areas

Construction impacts to the avifaunas of riparian areas would be of concern regardless of the season because breeding birds, fall migrants, winter residents, and spring migrants all concentrate where there is food, water, and cover. Operation of the turbines may deflect migrating birds away (visual disturbance) from excellent habitat into lower quality areas which may not supply adequate food, water, and cover. The magnitude of this problem is also unknown, but should be studied as described by Schreiber et al. (1982) or newly designed research projects coordinated with phased development of turbine sites.

Coachella Valley Fringe-Toed Lizard (CVFTL)

The lizard would be subject to a variety of direct impacts, including surface disturbance, habitat fragmentation, and noise effects. Surface disturbances can include: construction sites for turbines, new and upgraded existing roads, underground transmission cables, temporary construction areas, overhead transmission lines, and substations (See Table 4-2). Since these lizards live within approximately 3 inches of the soil surface, they can be killed inadvertently and easily during construction, bulldozing of roads, and excavations, as well as later when vehicles use the roads. In addition, disturbed habitat could be further degraded through spread of weeds such as Russian thistle.

Another impact is fragmentation of previously undisturbed or relatively undisturbed habitat through road and facility construction. New roads in CVFTL habitat can be used as access for off-road vehicle recreationists who could disturb additional habitat. Off-road vehicle use has already damaged some habitat on public lands in the area (see LaPre 1981, field notes).

The probability of a measurable impact from sound levels is indicated by hearing losses which have been experimentally produced in the closely related Mohave fringe-toed lizard (*Uma scoparia*) by exposure to 95 db(A) for 500 seconds (Bondetto and Brattston 1978). The high sensitivity of these animals (which is typical of many animals adapted to the quiet desert environment) is illustrated by the fact that the human exposure limit set by OSHA for 95 db(A) is four hours.

Noise levels of 60-65 db(A) are generally considered by humans to be between "annoying" and "intrusive" (Bronson 1971). That permanent exposure to such sound pressure levels could cause CVFTL hearing losses certainly seems likely. Also, with ambient sound levels increased about 50 percent by the turbines, it is likely that even CVFTL with unaffected hearing would experience difficulty detecting key environmental sounds such as the approach of a sidewinder.

Noise from heavy equipment during construction would reach peak levels of 95 db(A) at 50 feet (generic EIR/EIS, March 1982 - Table VI-14). This noise level would cause hearing losses in CVFTL in the vicinity of the 20 turbines which would be constructed in or near CVFTL habitat. See above discussion of Bondetto and Brattston's (1978) findings. These impacts, while potentially severe for individual lizards, would be short term and probably not as detrimental to lizard populations as the impact for continued operation of the turbines.

There are other indirect impacts that could affect the area more extensively and far more significantly--either positively or negatively. Weaver (1979, 1981) undertook studies on the effects of windbreaks on sand transport and deposition in the Coachella Valley, and the effects of windbreaks on CVFTL habitat and populations. He (personal communication) has suggested that "there appears to be a very definite potential for measureable and significant effects on the aeolian sand projects." The effects of wind turbines may be localized and similar but not identical to the wind shielding of tamarisk (Turner et al. 1981, Weaver 1981). Sand transport could be slowed. Weaver has also suggested that turbines off-site, away from lizard habitat, could have an impact downwind, for example, on critical habitat outside of the immediate area.

Impacts could be positive; poor quality lizard habitat could be improved through increased sand deposition and changes in vegetation. Conversely, there could be negative impacts--loss of sand in important habitat areas. Weaver (1979, 1981) developed a three-dimensional mathematical model to analyze effects of changes in sand supply due to windbreaks on lizard habitat and on lizard population density. A similar model using computer simulation could be developed to deal with effects of changes in wind energy on sand transport and deposition.

The majority of critical CVFTL habitat is in private ownership and acquisition would be difficult and costly. Much of this area may not be acquired. The BLM-administered parcels currently contain the only habitat that is secure, even if habitat quality is low. Habitat on BLM parcels in the Whitewater area also is not windshielded and has a better potential for survival into the future and for use as a second preserve than other, better quality areas to the east and south.

Until there is more information on the distribution of lizards on public lands and the effects of wind energy turbines on sand transport and deposition both locally and throughout the Valley, little more can be said about the degree of impact on the CVFTL.

WINDFARMS

Special Habitat Areas

Whitewater Canyon ACEC

Impacts to habitat within and adjacent to this ACEC are anticipated to be very high from construction of 43 turbines, several meteorological towers, roads, and underground lines. Impacts would be particularly high in ecotonal habitats in the mouth and on the slopes of Whitewater Canyon in parts of eight sections. Habitat for many animal species would be permanently lost, temporary disturbance may take decades to centuries for recovery, and complete recovery of native vegetation may never occur.

Principal concerns are disturbance to reptile habitat from construction activities, roads, and turbines, and from new access for recreationists. New roads have very high potential for increasing the illegal collecting activities of commercial reptile dealers and hobbyists. These people drive dirt roads at night, often using spotlights looking for reptiles on or near roads. Reptile populations remaining in disturbed and adjacent undisturbed areas would become depleted. California Department of Fish and Game wardens currently patrol the area to control illegal activities. The network of new roads would make control and management much more difficult.

See section on riparian areas, migratory birds, raptors, and Least Bell's Vireo for additional information.

Big Morongo Canyon

No applications have been filed on any areas within or adjacent to the ACEC boundaries, therefore there would not be any direct impacts.

Sand Dune Areas

The disturbance to specialized dune habitat are discussed under impacts to the Coachella Valley fringe-toed lizard. Factors of particular concern include the amount of surface disturbance, degree of habitat fragmentation of Federal parcels, and potential impacts on sand transport and deposition systems from the turbines at any location.

Migratory Birds

The overall effects of Windfarm's proposal on migratory birds cannot be predicted until further studies are conducted. The most serious apparent effect would be the close proximity of the string of large turbines (350-391 feet high) near riparian habitat at the mouth of Whitewater Canyon (Map 3-4). Because birds descending into and ascending out of that habitat would encounter WTGs travelling both east and west, the opportunity for collisions would be great. On the east side of the Canyon, winds deflected upward by the steep canyon wall are undoubtedly used by fall migrating birds as a source of lift, in which case they may be driven directly into the turbine blades at the top.

Waterfowl and Shorebirds

The Windfarms WTGs proposed for Section 20 (near Hugo) within the Whitewater River floodplain could pose a collision hazard to migratory waterfowl and shorebirds which use the Whitewater Settling Ponds as a stopover point (see Map 3-4). Map comparisons show the proposed Windfarm's turbines in the ponds themselves.

Raptors

In the uplands east of Whitewater Canyon near the northern border of the wind resource area, the Windfarm's turbines would be within one-eighth to one and one-half miles of four known Prairie Falcon nests and one Golden Eagle nest. The possibility of raptor collision with WTGs in this area would be greater than for any of the other proposals.

Birds of Riparian Zones

The importance of riparian/wetland habitats to birds is noted in Chapter 3. The Windfarms proposal would affect the birds of riparian habitats near the mouth of Whitewater Canyon and the wetlands near the Whitewater Settling Ponds. Both of these areas have considerable ingress and egress of both migratory and resident birds which could collide with turbine blades. The magnitude of this problem is not known at this time.

Reptiles and Amphibians

Impacts on reptiles and amphibians are described in detail for the San Geronio Pass and Coachella Valley habitats under the CVFTL discussion, and for the slopes and mountainous terrain of the San Bernardino Mountains under the discussion of the Whitewater Canyon ACEC. No impacts are anticipated on the San Jacinto and coastal herpetofaunas.

Rare, Threatened, Endangered, and Sensitive Animal

Coachella Valley Fringe-toed Lizard (CVFTL)

There is a high potential for impacting CVFTL habitat on 1,870 acres of public lands, although the exact amount of lizard habitat is not known. Impacts could be limited to surface disturbance or could be much more extensive. Surface disturbances can include: construction sites for turbines, new and upgraded existing roads, underground transmission cables, temporary construction areas, overhead transmission lines, and substations (See Table 4-2).

Areas temporarily or permanently lost to the lizard would include: 27.6 acres for construction of 20 turbines, and 25.5 acres for 7 miles of new roads and underground transmission cables. If all the areas proposed for surface disturbance contain lizards and lizard habitat, the projected disturbance of 53.3 acres may be low, because no estimates were made for dumping borrow and fill within or near the 30-foot road right-of-way. On the other hand, if there is little actual CVFTL habitat, acreages may be over estimated. Table 2-1 shows the amount of temporary and permanent land disturbance. The larger figure for temporary disturbance was used because disturbed desert habitat often requires decades to centuries for recovery.

The effect that noise from the turbines would have on the Coachella Valley fringe-toed lizard (CVFTL) is unknown. However, there are sufficient data to conclude that the sound pressure levels anticipated from the 2.5 to 4.0 MW turbines (60-65 db(A) at 750 feet) may cause permanent and ecologically significant hearing loss to lizards whose home ranges are within this radius of a turbine. If this interested hypothesis is correct about 940 acres of CVFTL habitat would be impacted by 20 of the 61 turbines proposed.

Flat-tailed Horned Lizard

It is assumed that this species occupies approximately the same habitat areas as the CVFTL; therefore, impacts to the flat-tailed horned lizard should be of the same type and magnitude as those to the CVFTL.

TABLE 4-2

The Effects of Surface Disturbance from Construction Activities
on the Coachella Valley Fringe-toed Lizard

SOUTHERN CALIFORNIA EDISON

	WINDFARMS	U.S. WINDPOWER	PANAERO	BOEING	BEAR STERNS/BEN.
Amount of Habitat (acres) ^{1/}	1,870	1,870	2,700	None	None
Habitat Disturbed (Acres) - permanent and temporary	53.3	120.5	75.0	None	None
Turbine sites	27.6	74.2	33.6		
Roads	25.5	42.3	37.8		
Other	0.2	4.0	8.7		
Degree of Habitat Fragmentation	Very Low	Very High	Moderate to High;	None	None
Overall Assessment of Impacts from Sur- face Disturbance	Low	Very High	High	None	None

^{1/} Maximum number of acres of potential habitat (worst case). The actual amount of acres is expected to be considerably lower.

TABLE 4-2

(continued)

The Effects of Surface Disturbance from Construction
Activities to the Coachella Valley Fringe-toed Lizard

SOUTHERN CALIFORNIA EDISON

	WECS TECH	U.S. WINDPOWER	WESTINGHOUSE	VENTUS	SAN GORGONIO FARMS
Amount of Habitat (acres) ^{1/}	None	None	520	1120	None
Habitat Disturbed (acres) - permanent and temp- orary	None	None	25.2	56.0	None
Turbine Sites			9.3	5.5	
Roads			14.5	49.1	
Other			1.4	1.4	
Degree of Habitat Fragmentation	None	None	Moderately High	High	None
Overall Assessment of Impacts from Surface Disturbance	None	None	Moderate	High	None

TABLE 4-2

(continued)

The Effects of Surface Disturbance from Construction
Activities to the Coachella Valley Fringe-toed Lizard

	CITY OF RIVERSIDE	SMART AND COMPANY			
Amount of Habitat (acres) ^{1/}	40 to 160	None			
Habitat Disturbed (acres) - permanent and temporary	1.1	None			
Turbine Sites	0				
Roads	1.1				
Other					
Degree of Habitat Fragmentation	Low	None			
Overall Assessments of Impacts from Surface Disturbance	Low	None			

Least Bell's Vireo

The Windfarms proposal may affect breeding of the Least Bell's Vireo in the riparian habitat of Whitewater Canyon one to two miles north of the town of Whitewater. Collision with turbine blades, behavioral effects that diminish breeding potentials, and possibly habitat destruction during construction are all possible but heretofore unquantifiable impacts.

Coachella Round-tailed Ground Squirrel

Assuming that this subspecies occupies approximately the same habitat as the CVFTL, impacts should be of the same type and magnitude of those to the CVFTL.

Peninsular and Desert Bighorn Sheep

The proposed siting of turbines along ridges on either side of Whitewater Canyon would extend from one to one and one-half miles into the range of the Desert bighorn sheep. It is estimated that bighorn use of existing range within 1 1/2 to 2 miles line of sight of the turbines could be eliminated. This could amount to 4 to 7 square miles of habitat depending on the line of sight relationship between terrain and the turbine sites in the area.

U.S. WINDPOWER

A comparison of the relative effects on wildlife of 61 large turbines (Windfarms) versus 3,500 small turbines (U.S. Windpower) is not possible with existing information. However, on-site disturbance to animals by hundreds of whirling windmills per square mile is difficult to dismiss. Although a few disturbance-tolerant common animals (English Sparrows, Starlings, small rodents, etc.) have a propensity to adapt to any circumstance, the vast majority of species cannot adapt to conditions drastically different from those under which they evolved for millennia.

Migratory bird impacts may be less severe than for the Windfarms proposal due to the lower height (90 feet) of the Windpower turbines. However, the large number of turbines (3,500 vs. 61 for Windfarms) may increase the effects of U.S. Windpower's planned development.

Impacts would be as described for Windfarms except as specifically noted below.

Special Habitat Areas

Whitewater Canyon ACEC

Approximately 2,000 acres of habitat (Sections 27 and 34, T.2S, R.3E; Section 3, T.3S, R.3E) would be impacted from development within or near the ACEC boundary. The proposal for 10 to 11 parallel lines of roads and turbines in Section 34 would likely have very high impacts on the southwestern edge of the ACEC, the canyon mouth and slopes, because of the high ratio of surface disturbance per unit area.

Rare, Threatened, Endangered, and Sensitive Animals

Coachella Valley Fringe-Toed Lizard

Surface disturbance to habitat would be 74 acres from 1,650 turbines, 42 acres from roads, 3 acres from transmission lines and less than 1 acre from substations, a total of 120 acres. Approximately 26 percent of the area in CVFTL habitat would be disturbed temporarily or permanently. The degree of habitat fragmentation would be much higher than for Windfarms because of the placement of turbines 85 feet apart and parallel lines of turbines and roads 500 feet apart. Access to habitat by recreational vehicle users would be extensive, and there could be secondary impacts from this source over the long term.

Noise would effect the CVFTL in a different manner than but to a similar degree as the Windfarms project. The same general areas would be affected, but the impacts from construction noise would be greater as evidenced by the much greater number of turbines to be installed (1,650 vs. 20) and greater area of permanent ground disturbance (455 acres vs. 60 acres). The noise of individual operating turbines would be much less than that of the MOD-2 (52 db(A) at the tower vs. 60-65 db(A) at 750 feet). However, the magnitude and possible tonalities of the combined sound of 1,650 machines may be sufficient to impact the CVFTL.

Peninsular and Desert Bighorn Sheep

U.S. Winopower turbines would be erected within 1/2 mile of Peninsular bighorn sheep habitat near Windy Point. This may result in visual disturbance to 1 to 1 1/2 square miles of bighorn sheep habitat. The turbines west of Whitewater Canyon would extend about 1/8 of a mile into the range of the desert bighorn sheep affecting 4 to 5 square miles of sheep habitat within a 2 mile line of sight.

SOUTHERN CALIFORNIA EDISON

Impacts would be as described for Windfarms except as specifically noted below.

Boeing

The Boeing/SCE proposal would place five large turbines squarely across the preferred songbird migration route through San Geronio Pass. These turbines, extending 350 feet into the air would potentially affect migratory birds of many types. This site would be excellent for turbine impact studies, but full field development should await the results of such studies and ongoing radar bird migration research.

The electric distribution lines associated with this proposal would not be safe for raptors or other large perching birds.

No impacts on the Coachella Valley Fringe-toed lizard are anticipated from surface disturbance during construction or from noise (Table 4-2). However, there are potential impacts from disturbance to sand transport and deposition systems and to other aspects of the lizard's ecology (see general discussion).

There will be no impacts on the Least Bell's Vireo and none on birds of riparian zones except during migratory periods. There are no records of plant species of concern occurring within or near the application.

Bear Sterns/Bendix

Impacts on the Whitewater Canyon ACEC would be similar to those described for windfarms, but would be much less extensive because of the smaller area involved. Five turbines and associated roads would lie within and immediately adjacent to the southeast part of the ACEC at the mouth of Whitewater Canyon.

WECS Tech

The area proposed for construction of 55 high turbines on the west side of Whitewater Hill may be important to migrating birds as a source of lift, including the Least Bell's Vireo. The extent to which migratory songbirds use wind currents around Whitewater Hill to provide access to or exit from the riparian areas in Whitewater Canyon is unknown.

The Coachella Valley Fringe-toed lizard would be affected as described by SCE/Boeing.

Westinghouse

The only problem with migratory songbirds under this proposal is the underlying problem of migration through the Coachella Valley which is the subject of ongoing radar studies.

Coachella Valley Fringe-Toed Lizard

Impacts on the CVFTL and its habitat would be similar to that described for windfarms with the following differences. The area likely to experience surface disturbance from construction activities is estimated at 24.3 acres (9.3 acres for turbines, 14.5 acres for roads, 0.3 acres for transmission lines, 0.2 acres for buildings and substations). Habitat fragmentation would be moderately high with five parallel rows of roads and turbines on one parcel of 125 acres.

Noise impacts from this proposal would have a greater adverse impact on the CVFTL than other proposals because of the large number of turbines and relatively high noise levels (58 db(A) at 750 feet).

Ventus

There would be no impacts on raptors and birds except during migration periods to and from riparian zones. For impacts related to the Whitewater settling ponds and to blowsand, see the analysis of the windfarm's proposal.

Coachella Fringe-Toed Lizard

The area is likely to experience surface disturbance from construction activities to an estimated 55.2 acres (5.5 acres for turbines, 49.1 acres for roads, 0.3 acres for transmission lines, and 0.3 acres for buildings

and substations). The degree of habitat fragmentation would be moderately high to high with 15 parallel rows of roads and turbines on 2 parcels totalling 1,120 acres.

Noise impacts would be much less than for the Windfarms, U.S. Windpower, and PanAero proposals for the two parcels. Noise is expected to attenuate to ambient levels within a few hundred feet of the turbines. Based on the number of machines proposed construction noise would be greater than all other proposals except for U.S. Windpower.

PANAERO

Impacts would be as described for Winofarms except as specifically noted below.

Parts of four sections of the Whitewater ACEC (Sections 27, 28, 29, and 34, T.2S., R.3E.) would be impacted by development and an additional two sections adjacent to the ACEC boundary would be directly affected. Major impacts would be anticipated on the southwestern part of the ACEC and the Canyon mouth and slopes.

Siting the 391-foot high Hamilton Standard WTG on the Coachella Valley floor would create a potential hazard for migrating birds. It is also possible that siting turbines in strings running perpendicular to the preferred migration direction of songbirds through the Valley would increase the likelihood for collision.

Riparian habitat at the mouth of Whitewater Canyon would be open for access by migratory birds. However, a problem remains near the Whitewater Settling Ponds, where large turbines would likely affect use by waterfowl and shorebirds. Also, turbines placed in T.3S., R.5E., Section 28 would be within one-half mile of Willow Hole, which attracts up to 85 species of birds (primarily songbirds), 81 percent of which are migratory.

Rare, Threatened, Endangered, and Sensitive Animals

Coachella Fringe-Toed Lizard

Approximately 2,700 acres of potential habitat could be impacted through the interruption of wind-blown sand. Surface disturbance due to construction would be 80.1 acres (33.6 acres for 192 turbines, 37.8 acres for roads, 5.1 acres for transmission lines, and 3.6 acres for structures and buildings). The degree of habitat fragmentation would be high because unlike the Windfarms proposal, the public lands would be split into several parts with roads and turbines.

Noise impacts would be similar in nature but greater in magnitude than those from the Windfarms project. Approximately 160 of the 500 kW turbines (58 ob(A) at 750') and 39 of the 4 MW turbines (65 ob(A) at 750') would be constructed in CVFTL habitat. About 2,000 acres would be receiving this or higher decible levels during operation. Impacts from noise during construction would be intermediate between that of the Windfarms and U.S. Windpower projects due to the number of machines (199) and permanent habitat disturbance (124 acres).

Least Bell's Vireo

PanAero turbines would be erected within 3/4 mile of Least Bell's Vireo habitat southeast of Willow Hole and west of Whitewater Canyon. Except during migratory periods, this 3/4 miles buffer area should be adequate.

Peninsular and Desert Bighorn Sheep

The PanAero turbines in the San Bernardino Mountains would extend nearly 2 miles into the range of the Desert bighorn in two different ridgetop locations. This could potentially disturb 6 to 8 square miles of bighorn sheep habitat. Also in the Windy Point area on the south side of the pass, 1 to 1 1/2 square miles of Peninsular bighorn sheep habitat may be lost as the bighorn retreats beyond the line of sight.

SAN GORGONIO FARMS

Impacts would be as described for Winofarms except as noted below.

Little or no potential habitat for the Coachella Valley Fringe-toed lizard exists here. Thus there is little or no potential for direct surface disturbances. However, there are potential impacts from disturbance to sand transport and disposition systems and to other aspects of the lizard's ecology.

CITY OF RIVERSIDE

Impacts would be as described for the Winofarms application except as specifically noted below.

Other than the potential disturbance to sand transport and deposition systems, no impacts on the CVFTL are anticipated from surface disturbance during construction.

Impacts on the Whitewater Canyon ACEC would be similar to that described for Winofarms, but less extensive. Eight turbines would be located within the ACEC in Section 34, T.2S., R.3E., and within 1/4 mile to the west. Moderate impacts are anticipated on the southwestern edge of the ACEC and the canyon mouth and slopes.

SMART

Any migratory birds which use the terrain on the south side of the Coachella Valley and San Gorgonio Pass as a leading line would encounter turbine blades between 400 and 460 feet above the surrounding terrain along a 1/2-mile long front. During the fall migration, when birds are traveling south, they may trend toward the south side of the Pass and fly directly over Windy Point. Radar studies are needed in this area to determine the altitude at which migrating birds fly.

At 400 to 460 feet above the surrounding terrain, the proposed turbines may interfere with Waterfowl and Shorebird migration, in spite of the fact that these bird groups generally migrate at higher altitudes than songbirds.

Raptors are known to use leading lines during migration and rely heavily on wind currents for lift and forward momentum. At the speed winds travel through the San Geronio Pass, many raptors as well as other birds may be swept past these turbines without being able to avoid them completely.

Coachella Valley Fringe-Toed Lizard

An estimated 40 to 160 acres of Coachella Valley Fringe-toed lizard habitat surrounds the development proposal at Windy Point. Although turbines, transmission lines and service roads would not be located on the habitat itself, there are potential impacts from disturbance to sand transport and deposition systems and other aspects of the lizard's ecology (See discussion under Windfarms).

Noise impacts on the CVFTL from this project would be the most severe of any of the projects because of the dense pattern of relatively large machines planned. Although only about 160 acres of habitat on public lands would be affected, both construction and operation noise impacts would be relatively intense.

Peninsular Bighorn Sheep

This proposal extends to within a few hundred yards of peninsular bighorn sheep habitat. About 2 to 2 1/2 square miles of habitat may be visually impacted to bighorn sheep within line of sight of the turbines.

NOISE

GENERAL

A generally accepted criterion for determining the existence of noise is audibility. Audibility can be determined by examining the background or ambient noise levels, the noise source's projected noise levels, and the tonal content of the noise. If a source's projected noise level is greater than or equal to the ambient noise level, it will probably be audible. A source whose tonal content is different than the existing ambient tonal content will tend to be more audible than one whose content is similar to the existing ambient tonal content.

Impulse noises are also particularly annoying to most persons. When evaluating the potential noise impacts from a proposed project, the characteristic of the noise source should be evaluated.

Construction

Table VI-14 generic EIR/EIS, March 1982 shows noise levels from various construction equipment. The highest noise levels are from large earth moving equipment, which typically produce peak noise levels in the range of 85 to 95 dB(A) at 50 feet.

Typical wind turbine construction practices may require a number of the large earth moving equipment units to operate concurrently. In Appendix A of the "Solano Windfarm Project Use Permit Application" (Windfarms, Jan. 1982), the construction noise from such operations was estimated to be approximately 60 dB(A) L_{eq} at 400 feet. Since a large wind turbine project may involve the construction of more than one wind turbine site at

a time, this estimate may be low. At distances greater than the separation between the wind turbine sites, the noise from the construction sites would appear to be from a single source. For the purpose of a worst case analysis, construction noise will be assumed to be from a single point and equivalent to 60 to 75 dB(A) L_{eq} at 400 feet (the 75 dB(A) level is equivalent to the peak construction noise level; i.e., 95 dB(A) at 50 feet). In addition, for the purposes of a worst-case analysis, noise will be assumed to attenuate at 6 dB per doubling of distance for both construction and operational noise; no excess attenuation due to ground effects, atmospheric absorption or barrier effects will be assumed, which would reduce the projected noise levels.

Based on the above assumptions, construction noise would attenuate to approximately 43 to 58 dB(A) within half a mile of the construction area. These noise levels would meet the Riverside County Noise Element recommendations of 60 dB(A) L_{dn} for rural or residential areas. If construction activities were limited to daylight hours (a reasonable assumption), these noise levels, would also meet the EPA recommendation of 55 dB(A) L_{dn} for residential areas. However, these noise levels may be audible to any residents that might be within a half mile of the construction area, and therefore, are potentially annoying. Construction noise levels should attenuate to ambient noise levels or lower, within a mile of the site, and therefore should not result in any significant impacts.

Construction of the wind turbine projects would also result in increased traffic on local roads and highways in the study area. Because the traffic on the main highways in the area is high, the addition of construction traffic should not result in a significant noise increase (see Figure III-20, generic EIR/EIS, March 1982). Construction traffic on local roads in the area may however result in some short-term noise impacts.

Operation

Sources

There are a number of potential noise sources from wind turbine operation. Noise would be generated from the operation of the generator, the transformer, the gearbox, and from the wind turbine blades. The latter noise source would be the predominant noise source in the far-field of the wind turbine (far-field are distances greater than two to three times the largest dimension of the wind turbine; near-field is the opposite of far-field). The former noise sources would generally only be discernable in the near field of the wind turbine. Noise would be generated from a number of phenomena associated with the wind turbine blade interaction with the air. The primary causes of noise are (1) fluctuating lift resulting from the interaction of the blades with the atmospheric turbulence of the wind, (2) the interaction of the blade turbulent boundary layer with the trailing edge of the blade, (3) direct acoustic radiation from the turbulent boundary layer, (4) direct acoustic radiation from the turbulent wakes of the blades, and (5) interaction of the tower wake with the turbine blades on wind turbines where the blades are downwind of the tower; i.e., downwind turbines. Of these, the first two are the dominant causes of noise.

Directivity of Noise

In the near-field, noise from wind turbine operations would be uniform in all directions, although there would be a null zone in the plane of rotation of the blade. In general, noise propagating in the same direction to which the wind is blowing, would tend to be directed downward. In contrast, noise propagating in the direction from which the wind is blowing, would tend to be directed upward (i.e., reducing the noise level). This characteristic of noise would tend to make the noise from wind turbines directional in the far-field of the wind turbine (i.e., noise will be highest in the downwind direction from the turbine). Figure 4-16 shows the potential affects of wind refraction of noise for the Boeing MOD-2 wind turbine. This directional effect would tend to reduce the potential for noise impacts in directions other than the downwind direction from the wind turbine. Since wind direction is predominately from the west, any noise sensitive receptors either north, south, or west of a proposed wind turbine site would be impacted less than those east of any proposed wind turbine site.

Tonal Content

Experience has indicated that noise generated by operation of most wind turbines is within ranges acceptable to human beings. However, infrasound noise problems have been encountered in the past with the MGC-1, a large downwind turbine generator. During testing of this wind turbine complaints were received from residents within two miles of the site of a "thumping" type noise, which could be felt more than it could be heard, and that sometimes caused windows and objects in their homes to rattle. This phenomenon may be unique to this particular turbine and support structure. The cause of the thumping noise was determined to be the interaction of the blades and unstable vortex flows in the wake of the turbine's support tower legs (generic EIR/EIS, March 1982). There are many potential factors that will influence whether a downwind turbine will cause this type of thumping noise. The type of tower support structure, blade design, number of blades, wind speed, and wind turbulence are some of the potential factors. Tests on other downwind turbines has not shown the thumping noise to be a problem with the possible exception of the vertical axis wind turbines.

Figure VI-22 in the generic EIR/EIS shows the characteristics of wind turbine noise. Although the human ear is less sensitive to low frequency noises, these noises may be noticeable to some persons, since low frequencies will attenuate at a slower rate than higher frequencies. This phenomenon may occur at distances greater than one-quarter to one-half mile from the wind turbine. If the projected noise level is more than 5 to 10 dB below the existing ambient levels, these low frequency noises will probably not be audible to the normal person.

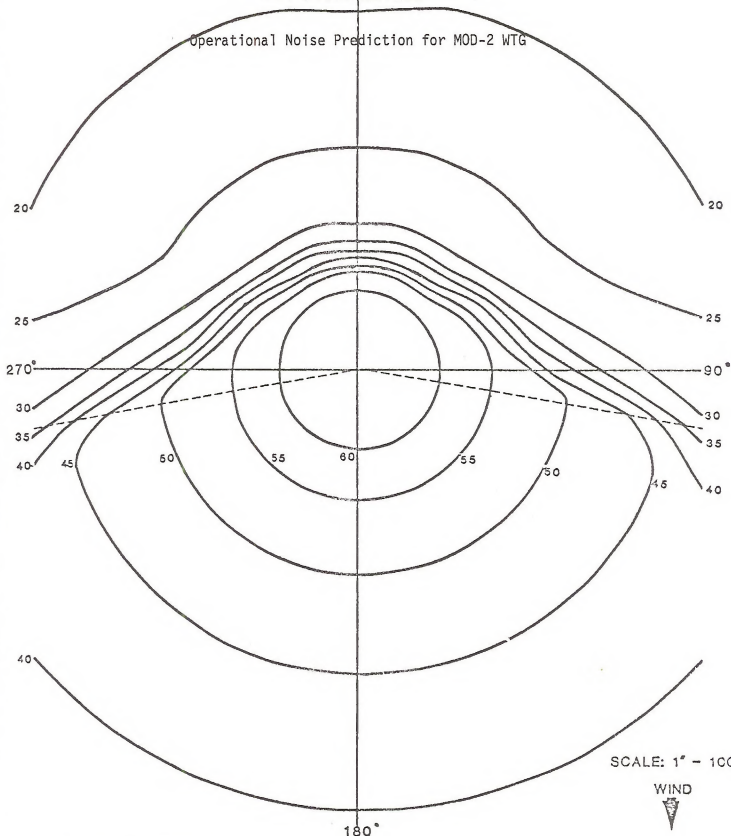
Magnitude of the Noise

There is limited data on the magnitude of noise from operation of the various types of wind turbines currently available. The noise level for the Boeing MOD-2 (2.5 MW) wind turbine was estimated to be approximately 60 dB(A) at 750 feet (downwind), in the Solano Windfarm Project Use Permit Application, Windfarms, January 1982. The noise levels from operation of the MOD-2 wind turbine would be less in directions other than the downwind

FIGURE 4-16

0°
dBA SOUND LEVELS

Operational Noise Prediction for MOD-2 WTG



--- LIMITS OF WIND SHADOW ZONE
140° AT 10 MPH DECREASING TO 90° AT HIGHER SPEEDS

— BEST ESTIMATE OF RADIATION

OPERATION NOISE PREDICTION
FOR MOD-2 WTG

SOURCE - SOLANO WINDFARM PROJECT

direction. Windfarms estimates the noise from the MOD-5A (a 5/6.2 MW turbine) to be 3 to 6 dB higher than the MOD-2 turbine. Based on the Windfarms analysis, it would appear that the larger the wind turbine the higher the noise level generated. However, this would depend on the design of the wind turbine, the number of blades, the blade tip speed, and the length of the blades. For this analysis, wind turbines of the same approximate capacity and design as the MOD-2 wind turbine would be assumed to generate noise of approximately 60 dB(A) at 750 feet in the downwind direction.

Smaller wind turbines appear to generate less noise than the larger machines. Information provided by SCE in their proposal, indicates that the Model 56-50 wind turbine (50 kW) produces 52 dB(A) at the tower base. SCE also indicates that the Westinghouse wind turbine (500 kW) would produce a noise level of approximately 60 dB(A) at 200 feet or 57.5 dB(A) at 750 feet. Based on this data and information from the generic EIR/EIS it would appear that wind turbines of less than 100 kW produce little noise, which generally reaches ambient levels within a short distance of the tower. Wind turbines of the 500 kW to 1 MW size appear to produce noise levels of approximately 55 to 58 dB(A) at 750 feet.

The above noise levels are for a single wind turbine and not for wind field arrays. Noise levels from the operation of a number of wind turbines may result in significant noise sources in some instances. Noise levels add on a logarithmic scale; that is, the energy levels that the dB levels represent are added rather than adding the dB levels themselves. For example, two noise sources of equal strength when added will have a composite noise level three dB higher than the single source, rather than the arithmetic sum of the two dB levels. If a noise level is to be added to another noise level which is 10 dB higher, the composite noise level is equal to the higher noise level. The higher noise level will mask or dominate the lower noise.

WINDFARMS

The location of Windfarms proposal is shown on Map 2-1. Windfarms would use the Boeing MOD-2 and Hamilton Standard WTS-4 wind turbines (rated at 2.5 MW and 4 MW respectively). These individual machines would generate noise in the range of 60 to 65 dB(A) at 750 feet.

The nearest residences to Phase I are located in the community of Bonnie Bell, which is approximately 4000 feet northwest of the nearest wind turbine site. Because the community is not generally downwind of the wind turbine site, it is not likely that the community would be impacted significantly. On those occasions when community residences are located downwind of the site the projected noise due to operation would be 45 to 50 dB(A). This noise level would not exceed the Riverside County Noise Element standards or the EPA recommendation of 55 dB(A) L_{dn} . The thumping noise associated with large, down-wind WTGs is not expected to be a problem because the MOD-2 is an upwind wind turbine and the majority of residences are upwind of the site.

The nearest residences to Phase II are also in Bonnie Bell, which is approximately 400 feet east of the nearest wind turbine site. Since the community is downwind of the nearest wind turbine site, operational noise from the site would range between 45 and 50 dB(A). These noise levels would meet the standards of Riverside County and EPA. However, when the T

ambient levels in the community are low, the operational noise may be audible to the residents. Usually the ambient noise levels would be low in the community when the wind is not blowing, in which case the wind turbines would not be operating. The thumping noise, if it materializes, might impact the community if Phase II is developed. Full development of Phases I and II should not increase the impact on the community over the impact of the nearest wind turbine.

The nearest residences to Phase III are in an area designated as rural residential approximately 1/2 mile northeast of the nearest wind turbine site. Since this residential area is not downwind of the wind turbine site, the impacts on this area should be insignificant. The projected noise level to this area would range between 49 and 54 dB(A). This range would meet the Riverside County Noise Element standards, although it would exceed the EPA recommendation. If the thumping noise materializes, this residential area could be impacted. Other wind turbines in Phase III of the project are further away from this area, and should not impact the residents.

The nearest residences to Phase IV are in an area designated as rural residential, which is approximately 1/4 mile north of the most westerly section to be developed. The nearest wind turbine in this area is approximately 1/4 mile to the southeast. The wind turbine sites are not generally upwind of the residential area. However, on those occasions when the wind turbines are upwind the projected noise from operation of the turbines would range between 55 and 60 dB(A). These noise levels would exceed both the Riverside County Noise Element and EPA recommendations. Because the wind turbines are relatively close to the residential area, the thumping noise may be a problem if the noise materializes. The residential area is also adjacent to Highway 10. Noise from the highway generally exceeds the Riverside County Noise Element and EPA recommendations. The highway noise will in general mask the operational noise from the wind turbines. The operation of the wind turbines should not result in a significant impact.

U.S. WINDPOWER

U.S. Windpower's proposal would use a small 50 kW turbine. This machine is relatively quiet and ambient noise levels should be obtained within a few hundred feet of the tower. Because of the relative size of the machine, it would not be expected to result in a thumping noise. The nearest residential area to Whitewater Canyon is the community of Bonnie Bell. The Whitewater Canyon proposal would use some of the same land proposed in Windfarm's Phase II. The nearest wind turbines to the community would be 4,000 feet upwind of the community. Noise from an individual wind turbine would not impact the community. However, the combined operational noise from the development of all 900 planned machines could result in a cumulative impact. This would be particularly true if these wind turbines generate any tonalities.

The nearest residential area to Whitewater Hill-Windy Point is an area designated as rural residential 1/4 mile north of the most westerly section of land proposed to be developed. This residential area would not normally be downwind of the wind turbines and impacts would not be significant. When the area was downwind of proposed development, it may be impacted by operational noise.

The nearest residential area to development in the Whitewater River area is an area designated as rural residential, 1/2 mile northeast of the northeast parcel for development. Because the residential area is not in the predominant downwind direction from the proposed development, it is not likely that this area would be significantly impacted.

SOUTHERN CALIFORNIA EDISON

The Boeing MGD-2 proposal is remote from any identifiable residential areas, and therefore should not result in any significant impacts.

SCE is proposing to use Bear Sterns/Bendix (4.5 MW) wind turbines on a portion of the same land applied for by Windfarms (Phase I). This wind turbine would likely result in an operational noise level of 65 dB(A) at 750 feet. The proposal should not significantly impact the community of Bonnie Bell).

The siting of WECS Tech (100 kW) wind turbines should generate little noise; as ambient noise levels would be reached within a few hundred feet of the wind turbines. There should be little or no impact on the residential area northwest of the proposal.

The Westinghouse proposal in Section 22 is relatively remote from identifiable noise-sensitive receptors, and therefore, development would not be expected to result in any significant impacts.

The Ventus turbines would likely generate little noise, attenuating to ambient levels within a few hundred feet of an individual wind turbine. Because of the number of towers (200) to be installed in the area, the proposal may impact the rural residential area to the north on those occasions when the area is downwind of development. The majority of time, the residential area would not be downwind of development, and therefore, would not be significantly effected.

PANAERO

The operational noise which would result from siting the Hamilton Standard, DAF Indal and Westinghouse wind turbines should range between 58 and 65 dB(A). The thumping noise may be a problem for these proposals because of the siting of downwind turbines. Measurements on a 56 foot Darrius verticla axis turbine in Texas suggested that the turbine has the potential for occasionally reaching impulsive levels similar to that of the MOD-1 (generic EIR/EIS, March 1982).

Facility 1 (Desert Hot Springs), is located on the same three sections of land as Windfarm's Phase IV proposal. Impacts would generally be the same except where PanAero's proposal extends to the southwest. Here, wind turbines would be sited 1/4 mile east of an area designated for single family homes. Highway 111, however, is between the development and residential area, and it is unlikely that development would significantly add to the existing impact of the highway.

Whitewater Canyon -- Facility 2 East, is remote from any identifiable residential areas, and therefore, is not likely to have a significant impact.

Facility 2 Northwest, located in the same area as Windfarm's Phase II proposal, would likely result in similar impacts.

Facilities 3 and 4 are located in remote areas. The nearest residences are located approximately one mile north of the proposed development. It is not likely that development of these facilities would result in significant impacts.

SAN GORGONIO FARMS

San Gorgonio Farms is proposing to use the Carter (25 kW) wind turbine. This wind turbine should generate little noise and should attenuate to ambient noise levels within a few hundred feet of the base of the tower. The San Gorgonio Farms proposal would have little impact on the residential area located in a northeast direction.

CITY OF RIVERSIDE

Noise impacts would be similar to those in Windfarm's (Phase II) proposal.

SMART

Smart is proposing to use the Merkhams 2 MW wind turbine. Although no noise data exists for this type of machine, based on other two-bladed wind turbines of the same size, it would be expected to generate noise of approximately 60 dB(A) at 750 feet. Because the proposed machine is a downwind turbine, there is a potential that the thumping noise may be a problem. The nearest residential area to Windy Point is approximately 1/2 mile southeast of the site. The majority of the time the residential area would not be downwind of development and there should be no significant impacts. However, on those occasions when the residential area is downwind of development, noise would be approximately 49 dB(A). This noise level would meet both the Riverside County Noise Element Standard and EPA recommendation. This noise level might be audible to residents if there are tonalities in the noise from operation of the wind turbines.

COMMUNICATIONS INTERFERENCE

MICROWAVE

Once in position, each wind turbine would have a potential interference zone consisting of both a forward and backward region. The forward interference region, shaped like a narrow lobe and directed away from the transmitter, is created by the forward scattering of the blades. Also created is a backward interference region, cardioid in shape, which is centered at the wind turbine pointing toward the television transmitter.

A more detailed explanation of the potential interference zone may be found in Chapter VI of the San Gorgonio Wind Resource Study EIR/EIS (March 1982). That study also explains the potential for an interference zone for microwave systems. Interference zones from microwaves are formed around the receiver and along the transmitters' beam pattern. This interference zone for microwave is called the forbidden zone.

For the purpose of this impact analysis the forbidden zone for microwave is defined as a cone. This cone is developed by doubling the half-power beam width of the microwave antenna. For instance, if the half-power beam width is 6 degrees, the forbidden zone would appear as it does in Figure 4-17.

Additionally, objects are not allowed in the direct path between the transmitting and receiving antenna.

TELEVISION

The following criteria have been used to approximately identify impacts on television interference:

1. In the San Geronio Pass area and the valley between North Palm Springs and Palm Springs, television stations from Los Angeles (Mt. Wilson), Santa Rosa Mountains, and Edom Hill are presumed to be available to residents. Table 4-3 lists the television stations available in the area. This area is just outside the grade B reception areas for Los Angeles stations but can be received with high gain antennae. Near the proposed wind turbine development just north of Edom Hill only Edom Hill and Santa Rosa Mountain stations are presumed to be available.
2. Normally antennae would provide about 10 dB of rejection to unwanted signals (such as wind turbines). This assumption is used because (1) this type of antennae would typically be used to receive Los Angeles and to a lesser degree Edom Hill and Santa Rosa Mountain stations; and (2) the utilization of such antennae should be the first mitigation measure evaluated in the event interference is realized, and, therefore, the identified impact is that which is generally readily mitigable.

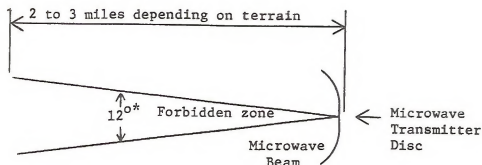
A 10 dB reduction in unwanted signal strength generally reduces interference by one-third, therefore reducing the area of interference of a WTG by an equal amount. Due to topography and the general characteristics of a typical antennae, 10 dB may or may not be realized. Therefore, this criteria will generally identify but not exactly specify impacts. This is justified due to the available mitigation measures, the absence of specific site information, and the state-of-the-art of communications interference prediction due to wind turbines.

3. The interference zone is presumed to be a circle of radius $R_{1a} + R_{1b}$ where R_{1a} is R_1 due to television station a, and R_{1b} is similarly derived. Additionally, there is a cigar shaped interference area defined by R_2 at each television station location.

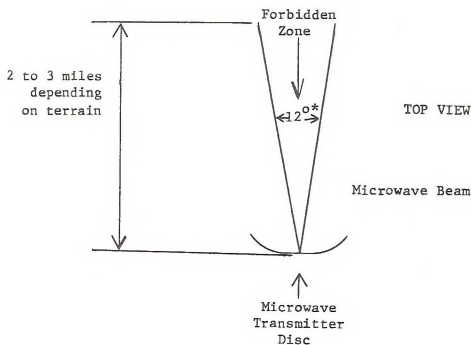
R_1 , $R(90)$, and R_2 distances are listed in Table 4-4. Except for the Boeing MOD-2, the R distances are rough extrapolated values. This is necessary because detailed data on all of the wind turbines is not reasonably available, and the computations are extremely time consuming. Finally, such computations are only rough approximations since they are based on simplifying assumptions regarding television station antenna height, method of propagation, ideal local topography, and other information. The interference zone that is depicted, is

FIGURE 4-17

Microwave Forbidden Zone



SIDE VIEW



TOP VIEW

* Enlarged for demonstration purposes.

intended to convey a general impression of what areas may be impacted. There is no exact way to specify the impacts prior to turbine installation.

Figures 4-18 and 4-19 (Map Folioer) show the approximate interference zone for large and medium size wind turbines. Specific R values are listed in Table 4-4. Large wind turbines may cause some interference to residences in T.2S., R.3E., Section 35, T.3S., R.4E., Section 32, 34, 8; and also T.3S., R.3E., Section 24, 11, 14, 10, and 5. Some interference due to large turbines may also be evident in residential areas within approximately 1/2 mile of a turbine near Edom Hill. Interference near Edom Hill is generally minimal due to the rather small R values and the location of residences.

Figures 4-18 and 4-19 are scaled at 2 inches to the mile and may be overlaid on each development proposal (Maps 2-1 through 2-5) to identify the interference zone.

Interference caused by medium sized turbines would generally occur to residences within 0.2 to 0.5 miles. Little or no interference would be expected from small turbines.

FM RADIO (88 to 108 MHz)

FM radio interference has not been a major problem in siting wind turbines. Fortunately FM reception is principally insensitive to amplitude changes in signal strength and, therefore, would generally not be bothered by reflections of disruption of the signal caused by a wind turbine.

FM broadcasts, however, are located on frequencies between TV channels 6 and 7, and weak stations may suffer some interference. For very weak stations, the interference zone would be similar to those shown in Figures 4-18 and 4-19 for television interference. The R values would be reduced to 100 meters or less. Since people tend to not listen to weak FM stations, little or no impact is anticipated.

BROADCAST RADIO

Broadcast radio interference due to wind turbines has not been reported in the literature. Large metallic objects do, however, affect radio reception, sometimes improving and sometimes degrading it. Because even a large wind turbine is rather small compared to a broadcast radio signal wavelength, no significant interference would be anticipated.

TWO-WAY RADIO SYSTEMS

Most two-way radio systems are high frequency FM and are principally insensitive to amplitude changes in signal strength. Two-way radio systems are used by fire, police, ambulance, and other services, and by amateur and citizen band operators. Two-way radio systems often operate both simplex (station to station) and duplex (station to repeater to station). Repeater facilities are commonly located on hills and mountains to increase the range.

TABLE 4-3

TELEVISION STATIONS RECEIVED IN STUDY AREA

STATION	TRANSMITTER	LOCATION
KESQ	Channel 42	Edom Hill
KMIR	Channel 36	Edom Hill
Religious	Channel 66	Edom Hill
XETV*	Channel 70	Santa Rosa Mountain
KFMB*	Channel 73	Santa Rosa Mountain
KOGO*	Channel 76	Santa Rosa Mountain
KNXT	Channel 2	Mount Wilson
KNBC	Channel 4	Mount Wilson
KTLA	Channel 5	Mount Wilson
KABC	Channel 7	Mount Wilson
KHJ	Channel 9	Mount Wilson
KTTV	Channel 11	Mount Wilson
KCOP	Channel 13	Mount Wilson

* Translated to identified channel.

While fixed station signal levels are generally strong, mobile reception because of topography is often marginal. With such low level signal reception, interference called "picket fencing" or multipath is common. An example of picket fencing could occur due to a row of trees, intervening mountains, or power transmission lines. As each tree is passed, for instance, the signal level drops, and the noise level increases, causing in some cases a misunderstood message. Given the contiguity of proposed wind turbines to roads and the large metallic structures, some interference to two-way communications may occur. Also, under low signal conditions, fixed stations may incur some interference during reception if located near wind turbines.

Interference with the reception of weak high frequency (30 MHz) amplitude modulated signals may also occur if such low level signal strengths were being received near an operating turbine. Amplitude modulated transmissions are seldom used, since they are sensitive to numerous noise sources. Impacts are, therefore, expected to be minimal or nonexistent.

VORTAC STATIONS

VORTAC stations provide directional and/or range information for air navigation. The Federal Aviation Administration has guidelines for the siting of large objects near VORTAC stations. These guidelines provide that no structure should be located within 1,200 feet, 1.5 vertical degrees of the ground level of a VORTAC antenna or 0.5 vertical degrees from the antenna itself.

TABLE 4-4

Television Interference Zone

PROPOSAL/WIND TURBINES	LOS ANGELES, +62 MILES 211 MHz			SANTA ROSA MOUNTAINS, 25 MILES, 800 MHz			EDOM HILL, 12 MILES 800 MHz		
	R ₁ ^{1/}	R(90)	R ₂	R ₁	R(90)	R ₂	R ₁	R(90)	R ₂
Wind Farms									
Boeing Mod-2	0.78	0.66	1.9	1.05	0.74	2.6	.78	.45	1.3
WTS-4	0.27	0.14	0.32	0.48	0.24	0.6	0.28	0.16	0.12
US Wind Power									
USW 56-50	0.06	0.04	0.09	0.12	0.06	0.16	0.07	0.05	0.11
Panero									
DAF Vertical	0.32	0.19	0.47	0.37	0.23	0.57	0.27	0.14	0.38
WWG 0500	0.13	0.07	0.17	0.33	0.12	0.30	0.13	0.09	0.21
WTS-4	0.27	0.14	0.33	0.48	0.24	0.6	0.28	0.16	0.12
SCE									
BX-WTG-V	0.27	0.15	0.36	0.47	0.26	0.62	0.28	0.18	.42
WT-605HAWT	0.18	0.11	0.27	0.21	0.13	0.32	0.15	0.08	0.22
WWG 0500	0.13	0.07	0.17	0.22	0.12	0.30	0.13	0.08	0.21
Ventus	0.07	0.04	0.09	0.12	0.06	0.16	0.07	0.05	0.11
San Gorgonio									
CWG-25	0.03	0.02	0.05	0.06	0.03	0.08	0.04	0.02	0.06
Smart & Co.									
MehrKam	1.52	0.89	2.2	1.76	1.08	2.73	1.28	0.67	1.82
Riverside									
Boeing Mod-2	0.78	0.66	1.9	1.05	0.74	2.6	0.78	0.45	1.3

^{1/} All R values are in miles.

Structures may be located on a slope below the ground level of the antenna. The only VORTAC station in the study area is on Edom Hill. Based on the above criteria and the elevation of the wind turbines near Edom Hill, there do not appear to be conflicts.

CULTURAL RESOURCES

WINDFARMS

Impacts on prehistoric or historic sites would be minimal. A series of cairns of unknown affiliation might be impacted at locations to the west of Whitewater Canyon. RIV-53T, the Coco-Maricopa Trail, crosses the proposed development area. Trail markers and segments might be destroyed. Nearby pottery scatters (RIV-75) and historic mining cairns (RIV-2168H) of low significance might be adversely affected. Wind turbine generator placement on Devil's Ridge could destroy portions of a historic (prehistoric?) trail system (RIV-2168H) of apparent minor significance.

Development may affect Native American locations of significance. Transmission lines and roads would be built in Whitewater Canyon and the Devil's Garden area, both zones of highest ethnographic significance. Mitigation of impacts, other than avoidance, would be difficult if not impossible. The Whitewater Canyon transmission line crossing would occur at the very south edge of the identified significant area. There is an ethnographic village with associated trails in the Garnet Hill area. Construction impacts from Phase IV development would be minimal.

Historic resources along the railroad may be present and could be impacted.

U.S WINDPOWER

Development could affect prehistoric trail segments, cairns and scattered ceramic localities in the area to the west of Whitewater Canyon. Development along or near the railroad may affect historic sites associated with the building of the railroad. By and large, though, the impacts to archaeological values would be minimal.

Whitewater Canyon, Windy Point, Whitewater Hill and Garnet Hill, all within or very close to proposed developments, have been identified as locations of various significance to local contemporary Native Americans. As such, there could be some infringement on religious values by development on or close to these places.

SOUTHERN CALIFORNIA EDISON

No known archaeological sites would be impacted by the Boeing proposal and because of active erosion no sites are expected. Impacts on Native American traditional values would be negligible.

The Bear Stearns/Bendix proposal could impact or destroy RIV-2170, a probable temporary camp. This site does not appear to be of National Register quality. Whitewater Canyon is a significant Native American Area.

The WECS Tech proposal may impact a segment of RIV-53T, the Coco-Maricopa Trail, which may run through the work area although its location has not been verified precisely. Impacts on Native American values appear insignificant, although other nearby hills have some mythological importance.

Proposed developments by Westinghouse and Ventus would occur primarily in active riverwash and no known sites occur here. There may be some historic sites associated with the railroad in this area which could be impacted. The proposed Westinghouse development is near a Garnet Hill site which has been identified as an ethnographic village with trails. Impacts on Native American values would be insignificant.

PANAERO

No direct impacts on archaeological resources are expected. Development could affect RIV-337, a trail within the Indio Hills, and RIV-53T, the Coco-Maricopa Trail. The project would come within 1/4 mile of a significant archaeological and Native American site, Willow Hole Oasis.

The primary effects of valley floor development on Native American values would be on the Garnet Hill and Whitewater Wash areas. Garnet Hill was the location of a historic Coachella village and remains an area of concern for some traditional Coachella. The river bed itself, known as paish: yara; 'nka'wanet, may prove to be sensitive. Facility IV may affect Edom Hill. The Agua Caliente Indians have specifically identified Edom Hill as environmentally sensitive.

SAN GORGONIO FARMS

Impacts on archaeological values would be minimal. Whitewater Hill holds some religious importance to Native Americans.

SMART

The proposal by Smart would not impact any prehistoric sites. Early to mid-20th century mining features may be impacted by road construction.

Windy Point has been identified as an important location in Cahuilla oral literature and construction would have an impact on local Native American values. Whether construction would interfere with traditional religious practices would have to be determined through further interviewing, although project interviews and literature search indicate this location does not hold the highest ethnographic significance in terms of the project area.

CITY OF RIVERSIDE

Impacts are not expected to be high. Three archaeological sites are known for the project area: a pottery scatter, a historic mining cairn, and a segment of RIV-53T, the Coco-Maricopa Trail, including a trail marker. All of these sites can probably be avoided by judicious facility placement. Impacts to contemporary local Native American values are more difficult to judge. The Whitewater Canyon area has been identified as of highest ethnographic significance. Most of these values are centered within the canyon proper, however. One location of concern, Kakuismu, may be located within the project area.

SOCIAL AND ECONOMIC CONDITIONS

ASSUMPTIONS

For proper tax revenue calculations, the assessed value of the turbines is assumed to be: 1) \$7 million per large turbine, 2) \$1.5 million per medium turbine, and 3) \$0.15 million per small turbine. The tax rate is 1 percent.

WINDFARMS

Employment

Average construction employment would be 28 people with a peak of 40 people. Operation and maintenance would consist of at least four technicians. This would not constitute a significant increment to employment in the County or the Study Area. Most employees would be recruited from the existing labor force in the Riverside-San Bernardino-Ontario SMSA which numbers over 26,000 people in the construction sector alone.

Housing

With most of the employment going to people already residing in the Riverside-San Bernardino-Ontario SMSA, and ready freeway commuting available to the population centers, little additional demand for housing would result in the Study Area. The total effect on housing demand in the County of Riverside would not be noticeable.

Tourism

The effects on tourism are uncertain, stemming primarily from the response of visitors to the visibility of the wind development. Both positive and negative perceptions are possible. A recent survey of visitors inquired about attitudes toward the potential wind development. The majority (92%) of interviewees thought that wind development would not result in substantially fewer visitors to the area (Harbicht Research Incorporated, "Energy Attitude Survey," undated, [BLM files]). In addition, the proposed development would not affect the major attractions for visitors, which are the community of Palm Springs, the desert climate, and a setting dominated by the presence of the San Jacinto Mountains. The net effect of the proposal on tourism in and around the Study Area is expected to be insignificant.

Public Cost and Revenue

Additional public costs could result from the additional heavy truck and construction worker traffic on county roads providing access to wind developments. This cost could primarily take the form of additional road maintenance and the installation of traffic lights at intersections. The amount of this cost is unknown but would probably be substantially less than the property tax revenues from the development.

Tax revenue from the proposed development would accrue to the County of Riverside primarily from property tax on the structures and equipment at the development site. To estimate this revenue it is assumed that the assessed value would be equal to the cost of construction, and the annual tax revenue would be one percent of the assessed value.

The property tax revenue from the proposed Windfarms development on BLM lands would increase as each of the four stages is completed:

<u>Phase</u>	<u>Estimated Annual Property Tax Revenue</u>
Phase 1 (complete April 1985) 7 large turbines	\$0.5 million
Phase 2 (complete Jan 1986) 13 large turbines	\$0.9 million
Phase 3 (complete Dec 1986) 10 large turbines	\$0.7 million
Phase 4 (complete Oct 1988) 20 large turbines	<u>\$1.4 million</u>
TOTAL	\$3.5 million

Electricity Rates

There is little likelihood the Windfarms proposal would reduce electricity rates because it would be such a small increment to the total system and the rates paid to the developers may be based on the cost of oil fired electricity generation. The Windfarms proposal would add generating capacity totalling 125 MW. The electricity generated would be fed into the Southern California Edison distribution system. This addition would be about one percent of the expected peak demand for electricity in the SCE service area in 1988 (Peak demand is estimated to be about 13,400 MW in 1988 based on data in Electricity Tomorrow - 1981 Final Report (biennial report), California Energy Commission, January 1981). Since wind turbines are ill-suited for supplying peaking capacity, they would probably become part of the base generation capacity, possibly displacing lower cost generating sources at times.

U.S. WINDPOWER

Employment

Average construction employment would be 14 people over a period of April 1982 to June 1988. Operation and maintenance would require 85 people at full development. Most employees would be acquired from the existing labor force in the Riverside-San Bernardino-Ontario SMSA.

Housing

With most of the employment going to people already residing in the Riverside-San Bernardino-Ontario SMSA, and ready freeway access available to the population centers, little additional demand for housing would result in the Study Area. Given the expected rate of growth of housing, the additional demand from this proposal would be insignificant.

Tourism

The net effect on tourism in the surrounding area is expected to be insignificant.

Public Cost and Revenue

Some additional road maintenance and traffic signal costs might be incurred by the County of Riverside. The amount is unknown at this time but is expected to be substantially less than the additional property tax revenues derived from the proposed wind turbine project.

The property tax revenue from the proposed development on BLM lands would increase as each of the three phases is completed.

<u>Phase</u>	<u>Estimated Annual Property Tax Revenue</u>
Phase 1 (complete Sep 1984) 900 small turbines	\$1.4 million
Phase 2 (complete Aug 1985) 350 small turbines	\$0.5 million
Phase 3 (complete Jun 1988) 1500 small turbines	<u>\$2.3 million</u>
TOTAL	\$4.2 million

Electricity Rates

There is little likelihood that the U.S. Windpower proposal would reduce electricity rates. The proposal would add 137.5 MW of generating capacity to the Southern California Edison system. This would be about one percent of peak demand in 1988 and would not be a significant increment.

If charges for wind generated power are equal to oil-fired generation costs, wind energy probably would not reduce rates.

SOUTHERN CALIFORNIA EDISON

Employment

Average construction employment would be 110 to 150 people over a period of two years. Employment for operation and maintenance is unknown. While the construction employment may appear substantial, most employees would be recruited from the existing labor force in the Riverside-San Bernardino-Ontario SMSA. This would not constitute a significant increment to total employment for Riverside County.

Housing

With most of the employment going to people already residing in the Riverside-San Bernardino-Ontario SMSA, and ready freeway access to the population centers, little additional demand for housing would result in the Study Area.

Tourism

The net effect on tourism in and around the Study Area is expected to be insignificant.

Public Cost and Revenue

Additional public costs could accrue to the County of Riverside for road maintenance and installation of traffic signals. The amount of cost is unknown at this time but may be expected to be substantially less than the property taxes derived from the development.

The property tax revenue from the proposed SCE development on BLM lands would increase as each of the "windparks" is completed:

<u>Wind Park</u>	<u>Estimated Annual Property Tax Revenue</u>
Boeing (complete Aug 1984) 5 large turbines	\$0.35 million
Bear Stearns/Bendix (complete July 1984) 5 large turbines	\$0.35 million
WECS Tech (complete Oct 1983) 55 medium turbines	\$0.83 million
U.S. Windpower (complete Apr. 1984) 100 small turbines	\$0.15 million
Westinghouse (complete June 1985) 60 medium turbines	\$0.90 million
Ventus (complete April 1985) 800 small turbines	<u>\$1.2 million</u>
TOTAL	\$3.78 million

Electricity Rates

There is little likelihood that the SCE proposal would noticeably affect rates. This proposal would add 105 MW to the SCE generating capacity, or less than 1 percent of the estimated peak demand in 1985 (peak demand is estimated to be about 12,800 MW in 1985 based on data in Electricity Tomorrow - 1981 Final Report [biennial report], California Energy Commission, January 1981).

If wind generated electricity costs equal oil-fired sources there would be no rate reduction.

PANAERO

Employment

Average construction employment would be 60 people with a maximum of 102 people. The amount of employment for operation and maintenance is unknown. Most employees would be recruited from the existing labor force in

the Riverside-San Bernardino-Ontario SMSA. This would not constitute a significant increment to employment in the County or the Study Area.

Housing

With most of the employment going to people already residing in the Riverside-San Bernardino-Ontario SMSA, and ready freeway access available to the population centers, little additional demand for housing would result in the Study Area. Given the expected rate of growth of housing, the additional demand from this proposal would be insignificant.

Tourism

The net effect on tourism in and around the Study Area is expected to be insignificant.

Public Cost and Revenue

Some additional road maintenance and traffic signal cost might be incurred by the County of Riverside. The amount is unknown but is expected to be substantially less than the additional property tax revenues derived from the proposed wind turbine project.

The property tax revenue from the proposed development on BLM lands would increase as each of the four phases is developed.

<u>Phase</u>	<u>Estimated Annual Property Tax Revenues</u>
Phase 1	
82 medium turbines (complete Oct 1984)	\$1.2 million
27 large turbines (complete Jun 1986)	\$1.9 million
Phase 2	
84 medium turbines (complete Aug 1985)	\$1.3 million
28 large turbines (complete Apr 1987)	\$2.0 million
Phase 3	
47 medium turbines (complete Feb 1988)	\$0.7 million
16 large turbines (complete Sep 1989)	\$1.1 million
Phase 4	
19 medium turbines (complete Jan 1989)	\$0.3 million
6 large turbines (complete Sep 1980)	<u>\$0.4 million</u>
TOTAL	\$8.9 million

Electricity Rates

The PanAero proposal would add 424 MW of generation capacity equal to about 3.1 percent of the estimated peak demand in the Southern California Edison system in 1990 (Peak demand is estimated to be about 14,000 MW in 1990 based on data in Electricity Tomorrow - 1981 Final Report [biennial report], California Energy Commission, January 1981). While this could be a significant addition to the system capacity it is unlikely that it would

reduce the electricity rates unless it were to cost SCE substantially less than oil-fired sources and had a high reliability factor. At best the rate reduction for the SCE system would be small.

SAN GORGONIO FARMS

Employment

Average employment for construction would be 10 people with a maximum of 17. Operation and maintenance employment is unknown. Most employees would be recruited from the existing labor force in the Riverside-San Bernardino-Ontario SMSA. This would not be a significant increment to employment in Riverside County.

Housing

Since most of the employment would go to people already residing in the Riverside-San Bernardino-Ontario SMSA little additional demand for housing would result in the Study Area.

Tourism

The net effect on tourism in and around the Study Area is expected to be insignificant.

Public Cost and Revenue

A minor amount of additional cost to the County of Riverside could result from road maintenance. This would probably be substantially less than the revenue derived from property tax on the development. The property tax revenue from the proposed San Gorgonio Farms development would increase as each of 3 phases is completed:

<u>Phase</u>	<u>Estimated Annual Property Tax Revenue</u>
Phase 1 (complete March 1983) 60 small turbines	\$ 0.1 million
Phase 2 (complete mid 1984) 30 medium turbines	\$ 0.5 million
Phase 3 (complete 1986, tentative) 5 large turbines	<u>\$ 0.4 million</u>
TOTAL	\$ 1.0 million

Electricity Rates

There is little likelihood that the San Gorgonio Farms proposal would noticeably reduce electricity rates. The 5.25 MW (tentatively 17.75 MW) of generating capacity would be less than 0.1 percent of the estimated peak demand for the SCE system in 1985.

If the charges for wind generated electricity are equal to oil-fired sources there probably could be no rate reduction.

CITY OF RIVERSIDE

Employment

Average construction employment would be 30 people with a peak of 40. At least four technicians would be employed for operation and maintenance. This would not constitute a significant increment to employment in the Study Area or Riverside County since most employees would come from the existing labor force.

Housing

No noticeable additional demand for housing in the Study Area or Riverside County would occur as a result of this proposal.

Tourism

The net effect on tourism in and around the Study Area is expected to be insignificant.

Public Costs and Revenue

Some additional costs could accrue to the County of Riverside for road maintenance.

There would appear to be no property tax revenues paid to the County for improvements built and owned by the City (See the Constitution of the State of California, Article 13, Section 1).

Electricity Rates

The 20 MW of generating capacity proposed by the City of Riverside would be about 5.5 percent of the City's projected 1986 peak demand (Estimated 1986 peak demand is 364 MW. Telephone conversation with Don Campbell, Riverside Public Utilities Department, February 9, 1982). This could tend to reduce the rates for Riverside customers because the utility would directly benefit from any savings. However, the effect on rates is not likely to be large enough to be noticeable due to the small portion of total demand served by the wind project.

SMART

Employment

Maximum construction employment would be 15 people. Operation and maintenance employment is unknown at this time. The employment from this proposal would not be a significant increment to the Study Area or Riverside County.

Housing

Little additional demand for housing would result from this proposal. The effect would not be noticeable in either the Study Area or Riverside county.

Tourism

The net effect of this proposal on tourism in and around the Study Area is expected to be insignificant.

Public Cost and Revenue

Public cost could occur to the County of Riverside due to the need for additional road maintenance. That cost would probably be substantially less than the property tax revenues from the project.

The property tax revenue from the proposed Smart development on BLM lands would increase as each of five phases is completed.

<u>Phase</u>	<u>Estimated Annual Property Tax Revenue</u>
Phase 1 (complete 1983) 1 large turbine	\$0.1 million
phases 2-5 (complete 1986)	<u>\$0.8 million</u>
TOTAL	\$0.9 million

Electricity Rates

There is little likelihood that the Smart proposal would reduce electricity rates. In 1986 the project would contribute 24 MW to the SCE system's generating capacity, or about 0.2 percent of the peak demand projected for that year.

If the charges for wind generated electricity are equal to oil-fired sources there probably could be no rated reduction effort.

MITIGATING MEASURES

Applicant Commitments

Although general guidelines for construction have been established, the applicants have not committed to specific mitigations, pending final design and location of WTG sites, access roads, transmission lines and substations. Several of the applicants consider these design decisions to be at least a year away.

Measures Required by the Bureau of Land Management

The following mitigation measures will be required by BLM under the conditions listed. The recommended mitigations for specific impacts are abstracted and rated for effectiveness in Table 4-5 and are categorized by environmental elements. Some mitigations apply to more than one resource and have varying degrees of effectiveness for the various resources.

TABLE 4-5

IMPACT MITIGATION EFFECTIVENESS

Impact Abstract	Mitigation	Applicable Location	Effectiveness
LAND USE			
Pacific Crest Trail (PCT) Crossing	No tower will be located closer than a distance of 1.25 times the height of the WTG.	All Public lands	Reduce safety hazard to travel users.
Impacts of wind energy development on wilderness values	Do not allow wind energy development on 11,070 acres of public land recommended by BLM as suitable for Wilderness Preservation. Defer development on 3,150 acres recommended as non-suitable for wilderness.	Whitewater Wilderness Study Area	Effectively preserves wilderness values until a final decision by Congress as mandated in section 603(c) of FLPMA.
Wind Access	No WTG will be sited closer than a distance of 1 1/2 to 3 times the height of the structure from east-west and north-south property lines, respectively.	All Public lands	Assure wind access in an equitable manner.
Interference with other land uses	No tower will be sited within a 1.25 times the height of the WTG from public highways, railroads, buildings and other structures.	All Public lands	Effective in reducing the visual effects and possible safety hazards of turbine development.
	Permittees and other regular users of public land affected by the project will be notified in advance of any construction activity that may affect their operations.	North Whitewater and Alta Mesa	Reduce disturbances to range improvements and removal and cutting of fences.
Safety	No WTG will be sited less than 1.25 times the height of the WTG from development springs.		
	Each WTG must be equipped with both manual and automatic controls to limit the rotational speed of the blade below the design limits of the rotor. Prior to construction the permittee will furnish BLM with a statement by a California-registered engineer certifying the electrical system complies with the National Electrical Safety Code and the Uniform Building Code.	All Public Lands	Reduces the risk of rotor failure to acceptable levels. Would comply with County standards.

TABLE 4-5

IMPACT MITIGATION EFFECTIVENESS

Impact Abstract	Mitigation	Applicable Location	Effectiveness
	The perimeter of all WTG sites will be fenced.		Access to the WTG will be restricted effectively reducing potential safety hazards.
VISUAL RESOURCES			
Visual impacts to contrast/dominance			
<u>Windfarms</u>	Remove the most southerly and two most northerly WTGs to comply with 25% slope restriction and 2/3 mile scenic setback from Interstate 10.	Painted Hill and Whitewater Hill	Would reduce site disturbance, contrast and dominance of the wind field so that visual resource objectives can be met.
	Relocate most southerly tower to an area north-east of present position to increase degree of distinctiveness.	North Whitewater and Alta Mesa	Would create "design" element on Alta Mesa and reduce contrast/dominance impacts close to visual standards without effecting overall visual resource quality.
	Remove three most northerly WTGs based on 25% slope restriction. Design array in two clusters to compliment the character of the landscape.		
	Limit WTGs to two distinct arrays along Devils Garden Ridge and remove two WTGs from Whitewater Hill because the area is a prominent visual landmark.	Devils Garden and Painted/Whitewater Hill(s)	Mitigation would be effective in creating complimentary WTG arrays thereby reducing visual contrast/dominance so that the overall visual resource quality would not be effected negatively.
<u>U.S Windpower</u>	Eliminate WTG siting on slopes over 25% and visually sensitive sites on the south side of Alta Mesa.	Alta Mesa/North Whitewater	Effectively mitigates proposal to meet visual resource objectives for this area.
	Impose setbacks 1/3 mile from Highway 111 and 1/4 mile from the top of Whitewater Hill.	Whitewater Hill and	Reduces visual clutter and dominance.

TABLE 4-5
IMPACT MITIGATION EFFECTIVENESS

Impact Abstract	Mitigation	Applicable Location	Effectiveness
	Reduce the number and location of machines in quarter sections and underground transmission line systems 34.5 kV and below. No development in NW 1/4, Section 22 No development in SW 1/4, Section 28 No development in SW 1/4, Section 20	Whitewater River Floodplain	Create "free zones" and "reduce visual clutter."
<u>Southern California Edison</u>	Same U.S. Windpower	Whitewater River Floodplain	Measures would effectively mitigate clutter and disorder thereby reducing visual contrast/dominance.
	Impose a modified setback of 1/4 mile from Interstate 10 and 1/4 mile from the top of Whitewater Hill.	Whitewater Hill	Natural break in topography will allow siting small WTGs less than 1/3 mile from a scenic highway.
	Restrict the siting of large machines in the area due to visual dominance.	Section 14	Removal of large machines would effectively reduce impacts to acceptable levels.
	Underground all transmission lines 34.5 kV and below.	All Public land	
<u>PanAero</u>	Color code to accent Hamilton Standard WTG; subordinate colors on other WTGs using neutral colors which compliment the characteristic landscape; setbacks with use of uniform tower type 1/4 mile on each end of ROW(s).	Whitewater River Floodplain	Would effectively mitigate visual contrast/dominance due to clutter and disorder effects.
	Limit development to slopes less than 25%. Develop Yucca ridge with only large machines in designed arrays (see Windfarms).	North Whitewater Section 27 and 34, North of Alta Mesa	Greatly reduce clutter and disorder effects and limit visual contrasts caused by site disturbance(s) on steep slopes.
	Design other two arrays with either uniform machines or limit to two machine types (large/medium).	Section 28 and 33	

TABLE 4-5
IMPACT MITIGATION EFFECTIVENESS

Impact Abstract	Mitigation	Applicable Location	Effectiveness
	Use uniform machine types and do not permit development on exposed slopes of 25% or more.	Alta Mesa	
	Limit to a uniform machine type.	Cabazon	Reduce visual impacts due to clutter and disorder to acceptable levels.
	No development on Flat Top mountain and the south side of Edom Hill.	Edom Hill	Reduce the level of contrast to acceptable levels.
	Permit uniform tower types in clusters rather than a straight line.	Section 28	
	Underground all transmission lines 34.5 kV and below.	All Public land	
<u>San Geronimo Windfarms</u>	(Same as U.S. Windpower and Windfarms)	Whitewater Hill	
<u>City of Riverside</u>	Relocate two wind turbines south of microwave tower.	North Whitewater	Would effectively reduce visual dominance and not have negative effect on overall visual resource quality.
<u>Smart and Company</u>	Exclude development on slopes over 25%	Windy Point	Meet County Hillside Development Standards.
	Exclude development along the crest of the ridge.	Windy Point	Prevent visual destruction of a significant landmark.
	Provide a setback of 2/3 mile from scenic Highway 111.	Windy Point	Preserve scenic quality along the major highway corridor into Palm Springs.
GEOTECHNICAL AND SOILS			
Damage to WTCs and ancillary facilities due to fault rupture	No facility or structure will be located closer than 50 feet from the trace of an active fault.	All Public lands	Surface rupture along an active fault would not result in a significant loss of generating capacity.

TABLE 4-5

IMPACT MITIGATION EFFECTIVENESS

Impact Abstract	Mitigation	Applicable Location	Effectiveness
Potential earthquake damage to switchyard facilities and service buildings	Underground transmission lines will be designed to withstand rupture or be rapidly repairable. Design specifications to meet Riverside County Uniform Building Code	All Public lands All Public lands	Only minimal damage to facility structures in the event of an earthquake.
Liquification	The applicant will conduct a geotechnical investigations to evaluate the potential for liquification. A mitigation plan will be submitted to to BLM prior to construction Identifying measures which will be used where liquified soils are a problem The siting of large numbers of turbines, buildings, switchyards and underground transmission lines will not be permitted in areas prone to deepseated liquifications.	All Public lands	Reduce the risk of loss to very low levels.
Landslides	WTGs will not be sited on unstable areas subject to landslides.	All Public lands	Eliminate hazard.
Erosion of soil around base (scouring)	Depth of scour will be evaluated in site geo-technical evaluations to locate foundations and underground facilities below the depth of scourable materials.	Whitewater Floodplain	Reduces or eliminates hazard.

TABLE 4-5

IMPACT MITIGATION EFFECTIVENESS

Impact Abstract	Mitigation	Applicable Location	Effectiveness
HYDROLOGY			
Inundation of WTG sites by floodwaters	The BLM will coordinate with the Riverside County Flood Control District to insure that development plans are in compliance with County of Riverside Ordinance No. 458 which regulates the construction of facilities within a floodplain.	Whitewater Floodplain	Minimize infiltration of flood waters and avoid impairment to facility structures during flooding.
Damage to tower foundations due to ground water withdrawal and/or subsidence.	Areas subject to deep or shallow subsidence will be mapped by the applicant and reviewed by BLM prior to final site approval.	Whitewater Floodplain	Identification of areas subject to subsidence will allow the incorporation of design modifications to compensate for the possibility of differential settling.
Potential damage to foundation material as a result of hydroconsolidation	Areas which may be susceptible to hydroconsolidation will be identified. The applicant will provide for adequate surface drainage and the removal and replacement of unconsolidated material with compacted fill.	Whitewater Floodplain	Increase WTG stability.
BIOLOGICAL RESOURCES			
Collision hazard to migratory birds	Defer siting WTGs until radar studies conducted during the spring and fall of 1982 are completed (January 1982).	Painted Hill	Provide BLM with site-specific information to assess the impact of siting large wind turbines along the east crest of Whitewater Canyon. Based on the predicted number of collision mortalities and the species of birds a decision would be made on whether to permit turbines in the area.
Hazard to waterfowl using settling pond	Prohibit development.	Whitewater Floodplain W1/2, W1/2, Section 20	Reduce collision hazard to resident and migratory waterfowl.

TABLE 4-5

IMPACT MITIGATION EFFECTIVENESS

Impact Abstract	Mitigation	Applicable Location	Effectiveness
Destruction of threatened animal habitat (Coachella Valley Fringe-toed Lizard) through WTG placement, access road and transmission line construction — and possible direct loss of some animals	Roads and other facilities may be located to avoid disturbance to individual sand dunes. When feasible roads would be placed on the up-wind side. Facilities that would function as windbreaks would be placed on the downwind side of individual dunes. Mitigation may be forthcoming from the Fish and Wildlife Consultation process. No recommendations are made at this time.	All Public lands, especially White-water Floodplain (See Map 3-5).	Protection of considerable CVFTL habitat. Potential for sand build-up on roads could be reduced.
Destruction of rare plants of concern where populations are in the path of WTGs and other facilities	Require the applicant (botanist) to survey the exact boundaries of known populations. Boundaries will be staked and access road and WTG sites re-routed to avoid these populations.	All Public lands	Avoid destruction of most rare plant populations.
NOISE			
Noise producing equipment used to erect WTGs during construction phase	Limit construction to daylight hours.	All Public lands	Reduce noise levels to the normal workday.
Impacts on residential development	WECS will meet the requirements of the noise element in the Riverside County General Plan. The applicant will develop a contingency plan subject to BLM approval, three months prior to operation to handle potential complaints before construction begins. The plan will include an assigned complaint officer and telephone number published where interested persons can locate them readily. The contingency plan will resolve any complaints within the areas of audible or radio noise, television interference, and elec-	All Public lands All Public lands	Standard contained within the noise element will help determine whether such noise is in violation of local policies. Construction or operation activities of any suspected turbine(s) would be discontinued until an investigation is conducted to determine the cause and effect of the problem.

TABLE 4-5
IMPACT MITIGATION EFFECTIVENESS

Impact Abstract	Mitigation	Applicable Location	Effectiveness
	trical (including electro-magnetic and electro-static) influence on any equipment, instruments, and appliances. The contingency plan will also be able to resolve any complaints involving health and safety in the areas described above.		
"Thumping" noise associated with large downwind turbines.	Any downwind WTC will be tested (and the results submitted to BLM) to determine if the wind turbine will generate the "thumping" noise.	All Public lands	Eliminate "thumping" noise.
	No WTC will be sited that results in generation of the noise.	All Public lands	
	No WTC will be located within 1/4 mile of any residence.	All Public lands	
COMMUNICATION INTERFERENCE			
Microwave Interference	No wind turbine generators will be sited within twice the half-power beam width of a receiving microwave signal.	All Public lands	Received signal levels beyond the beam width of a microwave antenna will be significantly reduced, thus reducing any reflections from a wind turbine.
	No WTC will be sited such that a transmitted microwave signal is directly impeded by a generator or is within twice the beam width of the transmitting antenna.	All Public lands	Prevent physical obstruction of the microwave signal and reduce the absorption of microwave energy for objects near the beam width.

TABLE 4-5

IMPACT MITIGATION EFFECTIVENESS

Impact Abstract	Mitigation	Applicable Location	Effectiveness
<u>Windfarms</u>			
Beam N-P and P-N Beams EE-GG, N-P, K, K-II, N-O, BB-CC, AA	Remove southernmost WTG. Eliminate WTG located south of microwave site on Whitewater Hill.	Phase I Phase III	Potential interference would be eliminated. Potential interference would be eliminated. Turbine just north of the site is close to a passing beam but is just past the zone of interference.
Beam E-D	Remove or relocate three northernmost turbines.	Phase IV	Interference resulting from WTG siting would be eliminated.
<u>U.S. Windpower</u>			
Beam EE-FF	None except possibly first few turbines sited south of microwave site.	Phase I, Section 34	
Beams N-P, K-I, and K-II	No turbines within 0.4 miles of the microwave site along a 12 degree cone.	Phase II, Whitewater Hill	No impediment further away due to lower elevations.
Beams N-O, Site K, and N-Q	No siting within 700 feet of microwave sites N and K	Phase II, Whitewater Hill	Beyond this location all beams will be above the rest of the turbines due to slope
Beam B-E	No turbines over 70 feet tall within a 5.5 degree beam width.	Section 14	Interference caused by machines located in northern part of the Section would be elimi- nated.
Beam B-E	Preclude all turbines within 11 degree beam width.	Phase II, Windy Point	Windy Point may afford some shielding which may allow more WTGs but more site investiga- tion is needed.
<u>Southern California Edison</u>			
Beam B-E	Structures over 70 feet would be precluded within the 5.5 degree beam width.	Boeing Site	Will eliminate siting problems in the north- east part of the section due to low beam ele- vations.

TABLE 4-5
IMPACT MITIGATION EFFECTIVENESS

Impact Abstract	Mitigation	Applicable Location	Effectiveness
Beam N-P	No turbines will be allowed inside a 12 degree beam width from a distance of 3,700 feet.	WECS Tech Site	
Beam M-L	No medium size turbines will be located within a 8 degree beam width.	Westinghouse Site	
<u>ParAero</u>			
Beam E-O	Preclude two northern most large turbines.	Facility I, Section 20	
Beam M-L	No turbines in east half of Section.	Facility I, Section 22	
Beam EE-OO	Beam passes over one turbine which will be eliminated.	Facility II, Section 33	
Beam EE-GG	Remove turbine proposed just SW of microwave site.	Facility II, Section 34	Beam interference will be eliminated, however this entire group of turbines may be too close to the microwave site. Follow-up site investigations are needed.
Beam B-E	Eliminate two large and three medium size turbines in northeasternmost corner.	Facility II, Section 14	Turbines will be eliminated within beam width.
Beam B-E	Prohibit all but northernmost vertical axis WTG along center row.	Facility II, Windy	Elimination would prove effective in reducing interference within the 5.5 degree beam width.
<u>San Geronimo Farms</u>			
Beam N-P	No turbines will be allowed inside a 12 degree beam width out to 3,700 feet.	Phase I, II, and III	
<u>City of Riverside</u>			
Beam FF-EE	No turbines will be sited along the beam width within 660 feet of microwave site.	Section 34	
Beam OD-EE	No turbines along 2.2 degree beam except between 700 feet and 2,300 feet from microwave site.	Section 34	

TABLE 4-5

IMPACT MITIGATION EFFECTIVENESS

Impact Abstract	Mitigation	Applicable Location	Effectiveness
<u>Smart</u>	Eliminate two turbines in the northeasternmost section of the wind park.	Windy Point	Exact turbine locations are uncertain but appear to be located in a position which may cause interference.
Television interference front site or back	Replace omni directional or marginally directional antenna with single channel antenna.		Considerable rejection of interference can be realized from front-to-side and front-to-back.
from one direction	Two antennas can be electrically phased together		Partially cancel interference.
	In those cases where a WTG is sited in the direct path between the receiver and television station and normal mitigation is ineffective, the applicant will: (1) pay initial hook-up fees for resident cable TV, or, (2) install a TV translator.		Will increase coverage and signal strength improving TV reception. Site-specific problems may still exist.
Radio interference FM Radio	Exchange interior antenna with an external high gain, directional antennae.	All Public land	Offer significant increase in signal strength and discriminate against interference.
Two-way radio, interference to mobile communications	Move the receiver out of the path of WTG and transmitting station.		Moving the receiver will not always prove to be effective alternative in improving communications.
	Use of nonmetallic blades will be required by BLM in instances where critical areas of interference develop.		Replacing metal blades with fiberglass or wood laminate will be an effective deterrent in most instances.
AM Radio	Same as FM Radio.		

ALTERNATIVE 2: DEVELOPMENT ON LANDS EXCEPT THOSE WITH SIGNIFICANT SURFACE CONFLICTS

INTRODUCTION

Impacts resulting from the implementation of Alternative 2 would be essentially as described under Alternative 1 above, with the exception of effects on microwave sites, television and FM radio reception, land use, visual resources, wildlife and socioeconomics. No turbines which could interfere with microwave transmissions would be sited under Alternative 2; therefore, no impacts are anticipated. Television and FM radio reception problems will be corrected by the applicant (by a series of steps up to and including cable hookups); hence no impacts are expected.

Impacts on land use, visual resources, wildlife and socioeconomics are described in detail below.

LAND USE

WINDFARMS

There would be no significant impacts on the recreational values of either the Whitewater ACEC or the Pacific Crest Trail.

The Whitewater Floodplain 20/28 and 22' parcels are located within the proposed Whitewater Regional Park. About fourteen turbines could be built in this area; if all fourteen turbines and their related facilities were constructed, only about 21 acres would be permanently occupied. Impacts of the wind farm on Park use and of Park use on the wind farm would be similar to those described for Alternative 1, although to a lesser degree.

The Whitewater WSA would be affected by development of the North Whitewater parcel only. Three turbines would be within the portion of the WSA recommended as non-suitable, together with an underground transmission cable and a road. Construction of the turbines would significantly impair the area's naturalness and other wilderness values, precluding future wilderness consideration of approximately 1/2 mile of the ridge just to the west of Whitewater Canyon.

No turbines would be constructed within the boundaries of the area recommended as suitable for wilderness designation.

U.S. WINDPOWER

The eastern portion of the North Whitewater parcel lies within the Whitewater ACEC. However, as this is not an area which receives significant recreation use, little impact is expected. There is no conflict with those ACEC management guidelines dealing with recreation.

Several rows of USW 56-50s would occupy the same parcels of public land as the Pacific Crest Trail in the Whitewater Floodplain 14 parcel. The survey route of the PCT runs north to south through this area, parallel to the proposed turbine rows. A 150-foot easement would be provided for the trail (based on a one and one-quarter blade diameter setback). While there would still be more than ample room for trail and easement within the 530-foot spacing between turbine rows, the trail must cross at least

one and possibly two rows in this area. A gap of approximately two turbines (based on an 85-foot turbine separation) would have to be provided for the trail at ROW crossings.

The applicant could construct up to 800 turbines on approximately 750 acres in the Whitewater Floodplain 20/28 and 22 parcels. These would be within the proposed Whitewater Regional Park. Impacts would be similar to those described for Alternative 1 although to a lesser degree due to the 60 percent reduction in intensity of development.

Over 200 acres of the northwest Whitewater parcel would be within that portion of the Whitewater WSA recommended as non-suitable. This would be an extremely dense grouping of turbines. As a result, there would be a complete loss of the naturalness of this area, eliminating opportunities for primitive recreation or solitude. Future designation as wilderness would be precluded.

SOUTHERN CALIFORNIA EDISON

There would be no impacts on recreation from the Boeing and Bear Sterns/Bendix proposals as development would not be permitted. No impacts would result from construction of the WECS Tech turbines as no recreational use areas would be affected (although this land has been proposed for inclusion as part of the regional park).

Westinghouse

This wind park, located in the Whitewater Floodplain 22 parcel, would occupy approximately 130 acres of a popular off-road vehicle and sunbathing area which has been proposed for inclusion in the Whitewater Regional Park. Access could be curtailed if a dike or rip-rap structure were used to protect the site from flooding. Within the area, the "feel" of the area would be somewhat altered by the turbine rows and access roads. Approximately 7 acres would be permanently occupied by roads and fenced facilities.

Ventus

The entire wind park, approximately 450 acres, would be fenced. This would result in the loss of a popular ORV and sunbathing area in the heart of the proposed Whitewater Park. However, the wind access setbacks would provide a gap of approximately 500 feet where the corners of the two sections meet, so no major barrier to movement across the floodplain would result.

PANAERO

Impacts on the Whitewater floodplain parcel would be similar to those described for Alternative 1, except that only about half as many turbines would be constructed, resulting in a correspondingly lower level of impact. There would be no impact on the Pacific Crest Trail or on the areas just north of Windy Point. Impacts on the Whitewater ACEC and on the non-suitable portion of the Whitewater WSA would be as described for Alternative 1, except that only eight turbines (all large Hamilton Standard WTS-4's) would be built in the WSA.

SAN GORGONIO FARMS

No popular recreation areas lie within the Whitewater Hill parcel, although it has been proposed for inclusion within the Whitewater Regional Park. Accordingly, no significant impacts are anticipated.

CITY OF RIVERSIDE

Five MOU-2s could be constructed within the North Whitewater parcel. Three could be within the Whitewater ACEC. As this is an area receiving little recreation use, no significant impacts are anticipated. None of the recreational guidelines for the ACEC would be affected.

No other significant impacts are anticipated.

SMART

No development on Windy Point would be allowed; hence no impacts are anticipated.

VISUAL RESOURCES

The severity of impacts resulting from construction of each of the three major components of wind energy development would vary. Impacts from access and service roads and from electrical transmission lines would be less than as described for Alternative 1. When constructed these facilities would, in many cases, meet the objectives of the different visual units in the study area. However, development of more than a few wind turbines in any one location would create visual contrasts even under the constraints of this alternative. In most parts of the study area, the scale or density of turbine arrays precludes mitigation of contrasts by concealment (i.e., screening with natural features or other forms). Camouflage by color, if permitted by the FAA would help reduce contrasts but not under all lighting and view situations. Siting development in relatively low contrast situations is feasible in only a few areas on the perimeter of the core of the most suitable wind development area (i.e., Eoom Hill).

However, in almost all cases the contrasts and dominance of the turbines would be at a moderate level which would be very close to acceptable standards. Developments would be distinctive, but would respect the characteristics of the landscape, and would not impair the overall visual resource quality. Figures 4-1 and 4-2 illustrate how Alternative 2 could be applied to a prototypical development scenario. The simulation does not indicate a preference for any of the applicants.

WINDFARMS

Impacts from site work and road construction would be at an acceptable level for both the Alta Mesa parcel and for the southern portion of the North Whitewater parcel. Development in North Whitewater would be restricted to Yucca Ridge and would utilize the existing road alignment below the 3,200 foot contour. The proposed WtGs would be visible from major travel routes and study area environs even after mitigation. However, prohibiting construction of the three most northerly turbines from Yucca Ridge and creating two design clusters of WtGs would reduce the visual

dominance of the towers by eliminating continuous strings of "skylined" towers, particularly from Whitewater Canyon. Use of low contrast colors (no FAA markings) would also reduce the line and color contrasts associated with the MOD-2 turbines.

The relocation of the southerly most WTG on Alta Mesa would create a more distinct design element, and low contrast color coding would reduce the line and color contrasts of this development.

The effect of turbine development in both areas would be minimized and meet the visual objectives for this area.

Whitewater River Floodplain

Visual impacts from road and pad construction would create moderate visual impacts and be within acceptable levels. Moderate impacts would occur from low contrasting color coding and "modified" FAA markings on the perimeter of the array(s). This would reduce the dominance of the WTGs and would meet the overall visual objectives of the area, even though the turbines would still be a distinct feature in the landscape.

U.S. WINDPOWER

North Whitewater/Alta Mesa

Visual impacts from road and pad construction would be at an acceptable level. The most effective constraints would be the restriction of turbines to slopes of less than 25 percent, and the following of contours when siting the arrays. Placing transmission systems underground within the road ROWs would also be effective in reducing impacts. These measures would result in less site disturbance associated with color and line contrasts. The use of low contrast color coding would also create less of a clutter effect and dominance of WTG arrays in the landscape. The visual objectives for this area would be met even though development would be a distinct element in the landscape.

Whitewater River Floodplain 14

The most effective constraints imposed by this alternative would be the limiting of the total number and intensity of machines, and the application of scenic highway setbacks from Interstate 10 and Route 111. This would include the prohibition of any machines in San Geronio Wash, scenic highway setbacks at the Whitewater wash site, and removing turbines from the foreground of Whitewater Hill. These constraints would result in a development which would respect visual landmarks.

Impacts from road and pad construction would meet the visual objectives for the area. The overall clutter and disorder associated with large arrays of smaller machines would not meet visual contrast objectives but the reduction of the number of machines in Alternative Two and color coding would reduce the dominance of the turbines and the effect on the overall visual resource quality to acceptable levels.

Whitewater River Floodplain 20/28 and 22

Limiting the overall density and distribution of machines and placing above-ground transmission systems underground in the road ROW would eliminate the impact of overhead lines, and would reduce the impacts of roads and other site elements to moderate/codominate contrast levels. The density and number of towers would not meet the visual objectives of this area. However, the unity of the landscape would be enhanced by laying out the WTG's in smaller defined clusters. This and use of color coding would lower the number of towers that could be seen as a single mass at any one time and would reduce the dominance of the wind turbines from Interstate 10 and Route 111 and adjoining residential areas. The WTGs would create moderately high contrast but would not dominate or reduce the overall visual resource quality of the area.

SOUTHERN CALIFORNIA EDISON

WECS Tech

The visual contrast and dominance of road and pad construction would be moderately low and within acceptable levels. Application of scenic highway setbacks, color requirements and specific constraints designed for Whitewater Hill would reduce the number of WTGs thereby reducing the effect of arrays of small machines and associated infrastructure. Contrast and dominance levels would be moderate. The overall visual objectives of the area would be met.

Westinghouse and Ventus

The overall density and number of towers would not meet the visual objectives of this area under Alternative 1. However, the unity of the landscape would be enhanced in Alternative 2 by the limited number of WTGs and by laying out the WTGs in defined clusters. This would limit impacts associated with roads and infrastructure, although WTG contrast would still be moderately high. Dominance of the wind turbines would be within acceptable levels and meet the overall visual objectives of the area.

PANAREO

North Whitewater/Alta Mesa/Cabazon

Development would be limited to less prominent areas of North Whitewater and the lower slopes of the canyon area behind Alta Mesa. Development would be restricted to a single WTG type (Hamilton Standard WTS-4) designed in two distinct arrays. This would prevent the clutter and disorder effect of mixed arrays, accent the characteristic landscape and reduce overall dominance. The other two arrays would be limited to lower slopes which would reduce their dominance of the area.

The visual contrast associated with the clutter and disorder of mixed arrays would be moderately strong. However, it would not dominate or impair the overall visual resource quality of the area. This relatively low level of impact would be controlled by color coding larger turbines a more distinct but complimentary color, painting other turbine types a neutral color, underground placement of transmission lines, and use of only two turbine types.

In the Alta Mesa area, development would be restricted to the mesa proper, all transmission systems would be placed underground, and only a uniform turbine type would be allowed. This would produce moderate visual impacts by preventing the clutter and disorder associated with mixed arrays and disturbance of steeper slopes by pad and road construction. Development would create moderate contrasts but would not dominate or impair the quality of the landscape.

The Cabazon site is highly visible from Interstate 10 and would be developed with only one machine type to minimize visual clutter (contrast) and dominance. The turbines would be color-coded a neutral complimentary color characteristic of the landscape. Only moderate visual impacts would result.

The proposal would meet overall visual objectives for all three areas.

Whitewater Flood Plain

Development in the Whitewater River Floodplain would be constructed in the same pattern as proposed by the applicant but reduced in extent by scenic highway setbacks from Route 111. Development would also be limited by allowing medium uniform WTGs for the first 1/4 mile on the ends of each string of turbines. WTGs would be color coded. Moderate visual contrast and dominance levels would result. Even though development would be highly visible from many areas within the study area, overall visual quality would not be impaired.

Flat Top Mountain/Edom Hill

The WTG facility would be limited to the northern portions of Edom Hill and only one site in section 28. Section 28 would be developed with only a designed cluster of a single WTG type and the remaining development would be color coded to reduce clutter and disorder of mixed arrays similar to the North Whitewater facility. The development would be a distinct element in the landscape even though there are power lines in the area. The development would be visible from Palm Valley, from distant views traveling east along Interstate 10 and from Desert Hot Springs. Views from Palm Springs and Thousand Palms would be limited because development has been restricted from primary view zones to the south. The development would create a moderate level of contrast and dominance. Visual quality would not be impaired and overall visual objectives would be met.

SAN GORGONIO FARMS

Whitewater Hill

The impacts would be similar to those described for the SCE-WECS Tech and U.S. Windpower proposals. Scenic highway setbacks and color mitigation for the small WTGs would limit line, color, and "clutter" contrasts of the smaller machines to a moderate/co-dominate level and meet the overall visual objectives of the area.

CITY OF RIVERSIDE

North Whitewater

Skylining and visual dominance would be reduced, particularly from the primary view zones to the east, by eliminating one of the two WTGs nearest the rim of Whitewater Canyon. Low contrast colors would be used to limit line and color contrasts of the WTGs and the general mitigation measures would ensure that contrasts associated with road and site work would be at moderately weak levels. Although the WTGs would still be visible and create some color and line contrast due to soil and vegetation disturbance, they would not dominate the landscape and would meet the visual objectives of the area.

BIOLOGICAL RESOURCES

In most cases the impacts of this alternative would be similar to those described for Alternative 1 except that they would be less severe due to a lower level of development. Impacts would be significantly different only where specifically noted below. For some important elements of the biological resource, such as rare plants and the Coachella Valley Fringe-toed lizard, site-specific information necessary to assess the relative impact of the different projects is lacking.

WINDFARMS

Whitewater Canyon ACEC

Impacts on the ACEC's biological resources would be similar to but less severe than those described for Alternative 1, particularly regarding reptiles and riparian birds. Impacts from the construction of turbines, towers and roads on the west side of Whitewater Canyon would still be significant, affecting three sections. Mitigation measures such as perimeter fencing would be neither effective nor realistic because of the scale of development. There would be no development, and therefore no impacts on the east side of Whitewater Canyon.

Migratory Birds

Migratory bird mortalities would occur in the manner described under Alternative 1. The total number of mortalities would probably be lower, however, due to the 51 percent reduction in the number of WTGs in the Windfarm's project. Particularly significant would be the elimination of large turbines along the east rim of Whitewater Canyon.

Waterfowl and Shorebirds

Wind turbines constructed in the Whitewater Floodplain 20/28 parcel would pose a collision hazard to migratory waterfowl and shorebirds which use the Whitewater settling ponds. Prohibiting the erection of turbines in the west half of the west half of Section 20 would reduce the potential for collisions, although some potential for impacts would remain from the two turbines which could be erected within one-half mile of the ponds.

Coachella Valley Fringe-Toed Lizard

Impacts would be as described by Alternative 1, although less severe due to the erection of 30 percent fewer turbines. However, as indicated under Alternative 1, site-specific information on the actual location of lizard habitat is needed before impacts can be accurately predicted.

Least Bell's Vireo

There would be a slight chance that the presence of the two Windfarm's turbines adjacent to the lower two miles of Whitewater Canyon would affect breeding of the Least Bell's Vireo in the canyon's riparian habitat. Some collision and behavioral impacts would also be possible.

U.S. WINDPOWER

Impacts on biological resources would be similar to but somewhat less severe than those described for Alternative 1. An overall project reduction of 44 percent would lower the level of permitted development within CVFTL habitat. Potential impacts on the CVFTL would remain high, however, due to the high degree of habitat fragmentation.

Potential impacts on migratory waterfowl would be relatively minor due to the prohibition of development near the Whitewater Settling Ponds, although the precise level of impact is unknown.

No constraints would be placed on development of the Northwest Whitewater parcel; accordingly, impacts would be the same as described under Alternative 1 for U.S. Windpower (Phase I).

Desert bighorn sheep would suffer the possible loss of 3-4 square miles of habitat in the North Whitewater area. However, there would be no impact on Peninsular bighorn sheep habitat due to the prohibition of development on Windy Point.

SOUTHERN CALIFORNIA EDISON

There would be no impacts from the Boeing and Bear Sterns/Bendix projects because construction of large turbines would not be allowed.

WECS Tech

The potential impact on migratory birds and the Coachella Valley Fringe-toed lizard described under Alternative 1 would be significantly reduced 64 percent in the WECS Tech project.

Westinghouse

The potential impact CVFTL habitat would be less because of the 60 percent reduction in the size of the project.

Ventus

Impacts on the CVFTL habitat would be reduced due to the 50 percent reduction in the size of the project. About two-thirds of the turbines fronting the Whitewater Settling Pond would be omitted, lessening the threat to migrating waterfowl and shorebirds.

PANAERO

Impacts on the Whitewater ACEC would be similar to, but somewhat less severe, than those described for Alternative 1 due to the lower level of development which would be permitted in this area (about a 25 percent cut). Approximately three to four square miles of Desert bighorn sheep habitat would be subject to impact. No Peninsular bighorn sheep would be affected.

Impacts on the CVFTL and on migrating birds would be similar to those described for Alternative 1 except that they would probably be somewhat less severe. Some potential for collisions between migrating birds and turbines would remain, even with a prohibition on development in the west half of the west half of Section 20 in the Whitewater Floodplain. Within the floodplain, several strings of large and medium turbines would be perpendicular to the flight path of the birds, creating a relatively high potential for collisions. Additionally, up to four medium turbines could be installed within one-half mile of Willow Hole, which attracts many migratory birds. There would also be some potential for collisions with turbines by prairie falcons using the known nest site in Section 30 in the Edom Hill area.

SAN GORGONIO

The potential impact on migratory birds and the CVFTL would be lower than that described under Alternative 1 due to the elimination of large turbines and the setback of smaller turbines.

CITY OF RIVERSIDE

Impacts on most biological resources would be reduced about 40 percent due to the scaling down of the project. Impacts on the Whitewater Canyon ACEC, the Least Bell's Vireo, and reptiles would be considerably less than under Alternative 1 because of setbacks from the east edge of Section 34.

SMART

No impact, as the project would be eliminated under this alternative.

SOCIAL AND ECONOMIC CONDITIONS

GENERAL IMPACTS

Employment, housing, and tourism in the San Gorgonio Pass Study Area would not be significantly affected. Approximately 70 people would be employed during construction, and less than that for operation. Most of these people would commute from the population centers outside of the Study Area. The overall effect on tourism is expected to be insignificant. These proposals would not affect the major tourist attractions in the Palm Springs area.

Public costs would result primarily from the need for additional road maintenance and traffic control facilities on county roads leading to the proposed wind turbine locations. These costs would accrue to the County of Riverside. Though the amount of these costs is unknown, it is expected to be substantially less than the potential property tax revenue.

When fully developed the property tax revenues to the County of Riverside would total \$4.4 million per year if applicants were selected which maximized the installed generation capacity. If the lowest capacity applications were selected the tax revenues would be \$2.7 million per year. In addition, 50 percent of the revenues to BLM from this development would be passed directly to the State of California which may, in turn, pass this share on to the County. Table 4-6 estimates the amount of property tax revenues which would accrue to the County.

WINDFARMS

Employment, Housing and Tourism

Employment, housing and tourism in the San Geronio Pass Study Area would not be significantly affected. Employment during construction would be less than the 28 people shown in Alternative 1, and shorter in duration. Likewise, housing needs would also be less. Effects on the tourist industry, expected to be insignificant under Alternative 1, would be less under this alternative.

Public Cost and Revenue

Public costs would be less than for Alternative 1 and be exceeded by property tax revenues to the County of Riverside.

As constrained in this alternative, Windfarms would be allowed to install 24 large wind turbines. The estimated property tax revenue from development would be \$1.7 million per year. Additionally, 50 percent of the BLM receipts from this development would be passed directly to the State of California. The State may, in turn, pass this on to the County.

Electricity Rates

With fewer wind turbines allowed than under Alternative 1, this alternative would not noticeably affect electricity rates.

U.S. WINDPOWER

Employment, Housing and Tourism

Employment, housing and tourism in the San Geronio Pass Study Area would not be significantly affected. Employment during construction would be both lower in number and shorter in duration than Alternative 1. Likewise, housing needs would be less. Effects on the tourism industry, though expected to be insignificant under Alternative 1, would be less under this alternative.

TABLE 4-6

Estimated Property Tax Revenue
by Parcel and Applicant^{1/}

<u>Parcel</u>	<u>Parcel Type</u>	<u>Applicant</u>	<u>Property Tax Revenue ^{2/} (\$000/yr.)</u>
Cabazon	Non-Competitive	PanAero	180
Alta Mesa	Competitive	PanAero	100
		Windfarms	210
	Non-Competitive	U.S. Windpower	86
		U.S. Windpower	66
		Windfarms	70
N. Whitewater	Competitive	City of Riverside	0
		Windfarms	490
		U.S. Windpower	413
		PanAero	300
	Non-Competitive	U.S. Windpower	54
		PanAero	420
Whitewater Hill	Competitive	U.S. Windpower	39
		SCE-WECS Tech	195
		San Geronio Farms	267
Whitewater Floodplain (14)	Competitive	U.S. Windpower	119
		SCE-Boeing	^{3/}
		PanAero	^{3/}
(20/28)	Competitive	PanAero	1,355
		U.S. Windpower	650
		SCE-Ventus	684
		Windfarms	770
(22)	Competitive	PanAero	260
		U.S. Windpower	258
		SCE-Westingshouse	165
		Windfarms	140
Edom Hill	Non-Competitive	PanAero	875

^{1/} Tax revenues from applicants for any single competitive parcel are not additive because only one applicant will be selected per parcel.

^{2/} Assumptions:

a) full development according to applicant proposal; b) assessed values based on construction costs per turbine: large turbine = \$7 million, medium turbine = \$1.5 million, small turbine = \$0.15 million; and c) property tax rate of one percent of assessed value.

^{3/} Property tax revenues would be approximately the same as for U.S. Windpower. A development plan for siting small turbines has not been submitted to BLM.

Public Cost and Revenue

Public costs would be less than for Alternative 1 and would be exceeded by property tax revenues to the County of Riverside.

As constrained in this alternative, U.S. Windpower would install 80 to 1,122 wind turbines, depending upon their success in the competitive bid process. Estimated property tax revenue from this development would be \$0.1 million to \$1.7 million per year. Additionally, 50 percent of BLM receipts from development would be passed directly to the State of California. The State may, in turn, pass this on to the County.

Electricity Rates

With fewer wind turbines allowed than under Alternative 1, this alternative would not noticeably affect electricity rates.

SOUTHERN CALIFORNIA EDISON

Employment, Housing and Tourism

Employment, housing and tourism in the San Geronio Pass Study Area would not be significantly affected. Employment during construction would be less than the 110 people shown for Alternative 1, and shorter in duration. Likewise, housing needs would also be less. Effects on the tourist industry, expected to be insignificant under Alternative 1, would be less under this alternative.

Public Costs and Revenues

Public costs would be less than under Alternative 1 and would be expected to be less than the property tax revenues to the County of Riverside.

As constrained in this alternative, Southern California Edison would be allowed to install up to 432 wind turbines, depending upon their success in being selected for competitive parcels. The estimated property tax revenue from this development is \$1.2 million per year. Fifty percent of the BLM receipts from this development would be passed directly to the State of California. The State may, in turn, pass this on to the County.

The property tax revenue from development on BLM lands would increase as each of the "wind parks" is completed:

<u>Wind Park</u>	<u>Estimated Annual Property Tax Revenue</u>
WECS Tech	\$0.3 million
213 medium turbines	
Westinghouse	\$0.2 million
11 medium turbines	
Ventus	\$0.7 million
456 small turbines	
Total	\$1.2 million

Electricity Rates

With fewer wind turbines allowed than under Alternative 1, this alternative would not noticeably affect electricity rates.

PANAERO

Employment, Housing and Tourism

Employment, housing and tourism in the San Geronio Pass Study Area would not be significantly affected. Employment during construction would be less than the 60 people shown for Alternative 1, and shorter in duration. Likewise, housing needs would also be less. Effects on the tourist industry, expected to be insignificant under Alternative 1, would be less under this alternative.

Public Costs and Revenue

Public costs would be less than under Alternative 1 and would be expected to be less than the property tax revenues to the County of Riverside.

As constrained in this alternative, PanAero would be allowed to install 46 to 130 wind turbines, depending upon their success in the bidding process. Estimated property tax revenue from this level of development would be \$1.3 million to \$3.5 million per year. Additionally, 50 percent of the BLM receipts from this development would be passed directly to the State of California. The State may, in turn, pass this on to the County.

Electricity Rates

The PanAero proposal in this alternative would add 163 megawatts of generating capacity to the SCE system. This would be about 1.3 percent of the system peak demand in 1990. Such an increment would not have a noticeable effect on electricity rates.

SAN GORGONIO FARMS

Employment, Housing and Tourism

Employment, housing and tourism in the San Geronio Pass Study Area would not be significantly affected. Employment during construction would be less than the 10 people shown for Alternative 1, and shorter in duration. Likewise, housing needs would also be less. Effects on the tourist industry would be insignificant.

Public Costs and Revenues

Public costs would be less than under Alternative 1 and would be expected to be less than the property tax revenues to the County of Riverside.

As constrained in this alternative San Geronio Farms would be allowed to install up to 34 wind turbines, depending upon their success in acquiring competitive bid parcels. The estimated property tax revenue from this development is \$0.3 million per year. Fifty percent of BLM receipts from development would be passed directly to the State of California. The State may, in turn, pass this on to the County.

Electricity Rates

This alternative would not noticeably affect electricity rates.

CITY OF RIVERSIDE

Employment, Housing and Tourism

Employment, housing and tourism in the San Geronio Pass Study Area would not be significantly affected. Employment during construction would be less than 30 people. Housing needs would not impact local communities. Effects on the tourist industry, expected to be insignificant under Alternative 1, would be less under this alternative.

Public Costs and Revenues

Public costs would be less than under Alternative 1. No property tax revenues would be paid to the County of Riverside from development by the City. However, 50 percent of the BLM receipts would be passed directly to the State of California. The State may, in turn, pass this on to the County.

Electricity Rates

The 17.5 MW of generating capacity proposed by the City of Riverside would be about 4.8 percent of the City's projected 1986 peak demand. This could tend to reduce the rates for Riverside customers but it is unlikely the effect would be enough to be noticeable.

UNAVOIDABLE ADVERSE IMPACTS

Project implementation would result in impacts on land use, visual quality, habitat condition, wildlife population, communications, safety and noise standards.

LAND USE

Placement of turbines, substations, transmission lines and roads would change present land uses. Recreational use patterns would be adversely affected on 1,200 acres of off-road vehicle use areas. A wilderness study area (recommended as non-suitable) would suffer reduced naturalness and loss of opportunities for solitude and primitive recreation.

VISUAL RESOURCES

Surface disturbances would alter the area's line, contrast and color characteristics. Wind turbines and the motion of their blades may dominate the landscape in some areas although the overall visual quality would not be degraded.

COMMUNICATIONS

Some localized interference with television and AM and FM radio reception may occur near wind turbine installations.

SAFETY HAZARDS

Towers with rotating blades would represent less of a potential safety hazard than an attractive nuisance to automobile drivers. Scenic and safety setback requirements would be effective in reducing accidents to minimum levels. Turbines would have a low probability of throwing their blades, creating a unique hazard to human populations.

NOISE

Noise levels would increase and periodically exceed local and Federal standards. Factors such as type of machine, wind direction and distance would make noise impacts highly variable but generally adverse.

HABITAT ALTERATION

Development of turbines and supporting roads and facilities would temporarily disturb 816 acres and occupy 450 acres on a permanent basis.

WILDLIFE

Loss of habitat would result. Wind turbines would cause an undefined but potentially serious factor in the death of birds due to collisions with towers, blades and supports. Excessive (60-65 dBA) noise levels near turbine installations would adversely affect wildlife.

RELATIONSHIP BETWEEN LOCAL SHORT-TERM PRODUCTIVITY AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The proposed action would increase short-term and long-term productivity. Use of wind resources for energy production increases resource productivity during the life of the project. Project termination, at any time, would have no impact on future production of wind resources.

Minor short-term reduction of site productivity will result from construction and operation of the wind developments. Long-term productivity will not be adversely affected.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Wind energy development would have no irreversible effects on wind resources. Land committed to project developments would not involve irretrievable commitments of resources.

ALTERNATIVE 3: NO ACTION

No action would result in little change in land use. The wind resource would remain undeveloped and public lands would not be disturbed by development.

Southern California Edison has proposed using wind energy to supply a significant portion of its increased energy needs over the next two decades. Development in the San Geronio Pass region would contribute the bulk of new wind generating capacity. If public lands are not developed for their wind potential, energy would have to be obtained from other

sources. This shortfall would amount to between 122 and 181 megawatts of capacity (generating between 450 and 850 million kilowatt hours annually). Although such sources as solar and biomass are available, and conservation could reduce demand somewhat, it is likely that much of the shortfall would be made up by increased use of coal, oil, and natural gas.

Coal powerplants producing an equivalent amount of power would, unlike wind, consume significant amounts of non-renewable natural resources and contribute to atmospheric pollution. For example, it was estimated that 4,000 tons of coal would be required daily to fuel a proposed 250 MW plant in southern Utah (Allen-Warner Valley EIS, 1980). This same plant would emit 372 tons of particulate matter, 1,894 tons of sulphur dioxide, and 6,287 tons of NO_x annually. For the proposed Ivanpah Coal Plant, the California Energy Commission estimates that each 500 megawatt unit, operating at only 65 percent of capacity, would emit 390 tons of carbon monoxide, 157 tons of hydrocarbons, 113 tons of total suspended particulates, 1,610 tons of sulphur dioxide and between 897 and 7,060 tons of NO_x annually (CEC Final Report on Cal Coal, 1980).

Similar resource requirements and pollutants would result from oil and natural gas fuel plants. For example, studies conducted for the proposed 1,245 megawatt Lucerne Valley cogeneration plant estimate that such a plant would emit 657 tons of combustion contaminants, 4,855 tons of sulphur dioxide and 7,227 tons of NO_x annually when an oil fuel was used, and 7,227 tons of NO_x (no tons of the other pollutants) annually when natural gas was used. The plant would consume 50,000 barrels of fuel oil per day (proponent's EIS, 1973).



CHAPTER 5

CONSULTATION & COORDINATION

CHAPTER FIVE

CONSULTATION AND COORDINATION

Consultation and coordination with the public and federal, state, and local agencies was a planned and integral part of the development of the alternatives analyzed in this Draft EIS.

The scoping process for the project was initiated in March, 1981 with a notice in the Federal Register announcing a series of scoping meetings to determine significant issues related to wind development in the San Geronio Pass. Information collected during these meetings resulted in the identification of a number of issues of public concern, including aesthetics, safety, noise, electromagnetic interference, ecology, land use, and wind access and equity.

For more detail on the scoping process, refer to Chapter 1 and the San Geronio Pass Wind Program: A report on Public Involvement in Identification of Issues, BLM and Riverside County, May 1981.

To identify concerns of the local Native American community regarding wind energy development various interested and knowledgeable members of the Morongo and Agua Caliente Tribes were consulted. Consultation was conducted informally, with the results summarized in the above referenced document.

The following summer and fall, BLM, Riverside County and the firm of Wagstaff and Brady (contractors for the generic EIR/ES) consulted with local and regional development interests, individuals, and regulatory and review agencies such as the Riverside County Flood Control District, Federal Aviation Administration, local community water districts, and the cities of Palm Springs and Desert Hot Springs to identify development options and potential constraints to wind development. From this information a wide range of development scenarios were developed for alternative analysis.

On March 19, 1982 a notice of availability for the generic San Geronio Wind Resource Study EIR/EIS was published in the Federal Register. The notice established a 45-day review period for public comment. The public meeting will be held in Palm Springs on April 23, 1982 to receive comment.

The review period for the overlap generic EIR/EIS will overlap that of the site-specific DEIS. After review of the DEIS the comments received on the site-specific analysis will be addressed in the preparation of the final EIS.

The BLM will then have the responsibility of preparing proposed development decisions from the final EIS and additional comments received during a 30-day public review period following preparation of the FEIS.

The following agencies, groups, and institutions will receive a copy of the Draft Environmental Impact Statement:

Federal

Department of Agriculture
Soil Conservation Service
Forest Service

Department of Defense
Corps of Engineers

Department of Energy
Department of Health, Education
and Welfare

Department of the Interior
Bureau of Indian Affairs
Bureau of Land Management
Bureau of Reclamation
Fish and Wildlife Service
Geological Survey
National Park Service
National Resources Library
(Washington, D.C.)

Department of Transportation
Federal Aviation
Administration

Federal Highway Administration
Advisory Council on Historical
Preservation
Council on Environmental
Quality
Environmental Protection
Agency
Federal Communications
Commission

State

Air Resources Board
California Coastal Commission
Department of Conservation
Department of Boating and Waterways
Department of Fish and Game
Department of Food and Agriculture
Department of Health Services
Department of Navigation and Ocean
Development
Department of Forestry
Department of Parks and Recreation
Department of Transportation
Department of Water Resources
Division of Aeronautics
Division of Highways

Division of Mines and Geology
Energy Commission
Governor Edmond G. Brown, Jr.
Historic Landmarks Advisory
Committee
State Lands Commission
Office of Planning and Research
Public Utilities Commission
Regional Water Quality Control
Colorado River Board of
California
State Clearinghouse
State Historic Preservation
Officer
Wildlife Federation Board

County

Riverside

Board of Supervisors
Planning Department
Department of Building and Safety
Department of Fire Protection

Airports Department
Flood Control
Communications Department
Community Action Agency

Parks Department
Sheriff's Department
Road Department

Department of Development
Health Department

Irrigation and Conservation Districts

Metropolitan Water District
Desert Water Agency

Whitewater Mutual Water Company
Desert Hot Springs Company
Water District

Indian Tribes and Councils

Morongo
Agua Caliente

Educational Institutions

University of California - Riverside

Libraries

Beaumont Public Library
Desert Hot Springs Public Library
Cathedral City Public Library

Coachella Public Library
Palm Desert Public Library
Riverside Public Library

Conservation Groups

Audubon Society
California Conservation Council
California Desert Conservation Area
Advisory Committee
California Natural Areas Coordinating
Council
California Wildlife Federation

Coachella Valley Ecological
Resources Foundation
Desert Beautiful
Nature Conservancy
Sierra Club
Wilderness Society

State Legislators

Assemblyman David Kelley
Senator William Craven

Congressional Representatives

Senator Alan Cranston
Senator S.I. Hayakawa
Representative Clair W. Bergener

User Groups

California Association of Four-Wheel
Drive Clubs
Desert People United
El Paso Natural Gas
General Telephone
Pacific Telephone Company

Southern California Edison
Company
Southern California Gas
Company
Southern Pacific Transportation
Company

Development Interests

San Geronio Farms, Inc.
Windfarms
AeroVironment, Inc.
City of Riverside
U.S Windpower
PanAero Corporation
Unilec Systems, Inc.
Thermal Power Company
Systems

Hamilton Standard
Lower San Geronio Pass
Improvement Association
MAEVA Resort and Develop-
ment Company
Smart
The Bendix Corporation

Public Interest Groups

Cabazon Chamber of Commerce
Coachella Valley Association of
Governments
Desert Hot Springs Chamber of
Commerce

Palm Springs Chamber of
Commerce
Solar Cal Council
West Palm Springs Chamber
of Commerce

Newspapers

The Daily-Record-Gazette
The Desert Sun

The Desert Sentinel
The Enterprise

LIST OF PREPARERS

NAME	TEAM ASSIGNMENT	EDUCATION	EXPERIENCE
William D. Payne	Team Leader	B.S. Forest Engineering University of Montana	BLM, 7 years, Environmental Specialist BIA, 4 years, Forester
William S. Haigh	Technical Coordinator Land Use	B.A. Geography, University of California, Los Angeles	BLM, 4 1/2 years, Environmental Specialist Army Map Service, 2 years, Technical Specialist
Michele J. Hall	Administrative Coordinator	1 Year, Sacramento City Graduate, Academy of Business Colleges	BLM, 2 years, Secretary Sacramento Army Depot 2 years, Secretary 7 years prior secretarial experience
Carl Rountree	Chapter One	B.A. Political Science, The Citadel M.C.R.P. City and Regional Planning, Clemson University	BLM, 1 year, Regional Planner U.S. Forest Service, 4 years, Planner BCD Council of Governments, 3 years, Sr. Planner
Alex Young	Visual Resources	B.S., Ornamental Horticulture (Landscape Design), Delaware Valley College MLA, Landscape Architecture and Regional Planning, University of Pennsylvania	BLM, 4 1/2 years, Landscape Architect Schnadelback/Braun, 8 years, Landscape Architect and Planning Consultant
Kristin Berry	Wildlife: Coachella Valley Fringe-toed Lizard, Rare Plants	B.A. Biology, Stanford Uni- versity M.A. Biology, University of California, Los Angeles Ph.D. Zoology, University California, Berkeley	BLM, 8 years, Zoologist, Department of Defense, 2 years, Biologist Private Research Consultant, 3 years, Owner of Firm

LIST OF PREPARERS

(continued)

NAME	TEAM ASSIGNMENT	EDUCATION	EXPERIENCE
C. Holden Brink	Wildlife	B.A. Biology, Whitman College M.S. Wildlife Management, University of Alaska Ph.D. Wildlife Science, Utah State University	BLM, 8 years, Environmental Specialist TVA, 4 years, Wildlife Biologist
Richard "Butch" Olendorff	Wildlife: Raptors, Migratory Birds, En- dangered Species Consultation	B.S. Zoology, University of Washington Ph.D. Zoology, Colorado State University	BLM, 8 years, Endangered Species Coordinator
Robert Laidlaw	Native American Values	B.A. Anthropology, Cali- fornia State University, Fullerton B.S. Philosophy, California State University, Fullerton M.A. Anthropolgy, California State University, Fullerton 2 years post graduate - Anthropology, University of California, Riverside.	BLM, 4 years, Anthropologist, HEW, 1 year, Anthropologist, University of California, Riverside 2 years, Instructor in Anthropology UCEX
Eric Ritter	Archaeology	B.A. Anthropology/Geography, University of Arizona M.S. and Ph.D. Anthropology University of California, Davis	BLM 8 years, Archaeologist Various State of California and University assignments, 8 years Archaeologist/Anthropologist Instructor in Anthropology/ Archaeology, University of California Riverside, 2 years UCEX

LIST OF PREPARERS

(continued)

NAME	TEAM ASSIGNMENT	EDUCATION	EXPERIENCE
Dale E. Bays	Social and Economic Conditions	B.S. Forestry, State University of New York Ph.D. Candidate Economics, Utah State	BLM, 9 years, 2 years Forester; 7 years, Economist
Zene D. Bohrer, Jr.	Hydrology	B.S. Agriculture, University of Wyoming	CEC, 7 years, Hydrologist Various public agencies, 18 years soils and hydrology specialist
Richard Buell	Noise	B.S. Mechanical Engineering, University of California, Berkeley	CEC, 5 years, Associate Mechanical Engineer
Albert McCuen	Communications	A.S. Electronics and Electrical Engineering, College of the Siskiyous B.S. Electronics and Electrical Engineering, California State University, Sacramento	CEC, 5 years, Electrical Engineer Private industry, 5 years, power plant design and communications.
Gaylon Lee	Geotechnical	B.S. Geology, Wheaton College M.S. Quaternary, Geology Arizona State University	CEC, 5 years, Geologist Consulting firms, 8 years, geologist
Rod Bradley	Cartography	A.A. Natural Resources, San Joaquin Delta College A.A. Drafting Technology, Sacramento City College	BLM, 8 years, draftsman

GLOSSARY

TERMS

ACEC	Area of Critical Environmental Concern
BLM	Bureau of Land Management
CDCA	California Desert Conservation Area
CEC	California Energy Commission
CFR	Code of Federal Regulations
CVFTL	Coachella Valley Fringe-toed Lizard
dBA	A-Weighted Decibel Scale
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
FLPMA	Federal Land Policy and Management Act of 1976
kV	Kilovolts
kW	Kilowatts
kWh	Kilowatt Hours
Ldn	Average Decibel Level (weighted towards night)
Leq	Average Decibel Level
MW	Megawatts
NEPA	National Environmental Policy Act
ORV	Off-Road Vehicle
PCT	Pacific Crest Trail
ROW	Right-of-Way
RPM	Revolutions per Minute
SCE	Southern California Edison Company
SHPO	State Historic Preservation Officer
SMSA	Standard Metropolitan Statistical Area
VRM	Visual Resource Management

Note: Many of the definitions which follow were obtained from the Meteorological Aspects of Siting Large Wind Turbines, pp G-1 to G-18, prepared for the U.S. Department of Energy, by the Pacific Northwest Laboratory, Richland, Washington (1981).

TERMS

AREA OF CRITICAL ENVIRONMENTAL CONCERN (ACEC): Areas within the public lands where special management attention is required (when such areas are developed or used or where no development is required) to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards.

ANEMOMETER: An instrument used to measure wind speed.

A-WEIGHTED DECIBEL SCALE (dBA): Noise level weighted to human perception.

BACKGROUND (VISUAL): The area of a distance zone which lies beyond the foreground-middleground. Usually from a minimum of 3 to 5 miles to a maximum of about 15 miles from a travel route, use area, or other observer position. Atmospheric conditions in some areas may limit the maximum to about 8 miles or increase it beyond 15 miles.

BLADE: A flat, thin structural component of a rotor.

BLADE TIP SPEED: The velocity of the tip of a blade of a rotor which is rotating at its optimum rate. Usually expressed in miles per hour.

CONTRAST: The effect of a striking difference in the form, line, color, or texture of the landscape features within the area being viewed.

CONTRAST RATING: A method of determining the extent of visual impact for an existing or proposed activity that will modify any landscape feature (land and water form, vegetation, and structures).

CRITICAL VIEWPOINTS: The point(s) commonly in use or potentially in use where the view of a management activity is the most disclosing.

CULTURAL RESOURCES: Those fragile and nonrenewable remains of human activity, occupation, or endeavor, which are reflected in district sites, structures, buildings, objects, artifacts, ruins, works of art, architecture or natural features.

CUT-IN SPEED: The wind speed at which the wind turbine control system initiates startup procedures.

CUT-OUT SPEED: The wind speed at which the wind turbine control system initiates shutdown procedures.

FOREGROUND-MIDDLEGROUND: The area visible from a travel route, use area, or other observer position to a distance of 3 to 5 miles. The outer boundary of this zone is defined as the point where the texture and form of individual plants are no longer apparent in the landscape. Vegetation is apparent only in patterns or outline.

TERMS

FORM: The mass or shape of an object or objects which appear unified, such as in the shape of the land surface or patterns placed on the landscape.

HORIZONTAL AXIS TURBINE: A wind turbine in which the rotor rotates about an axis that is horizontal and parallel to the wind. The axis is at hub height above ground.

HUB HEIGHT: The height above ground of the axis of a horizontal axis wind turbine. It is frequently assumed that hub height winds may be used to construct an adequate representation of the winds affecting the entire wind turbine. For a vertical axis wind turbine such a height would be midway between the top and bottom of the rotor.

KILOWATT: A unit of power equalling 1000 watts.

LANDSCAPE CHARACTERS: The arrangement of a particular landscape as formed by the variety and intensity of the landscape features and the four basic elements of form, line, color, and texture. These factors give the area a distinctive quality which distinguishes it from its immediate surroundings.

LANDSCAPE FEATURES: The land and water form, vegetation and structures which compose the characteristic landscape.

Ldn: Measure of average decibel level, weighted more heavily towards night and evening levels.

Leq: Measure of average decibel level.

LINE: The path, real or imagined, that the eye follows when perceiving abrupt differences in form, color or texture. Within landscapes, lines may be found as ridges, skylines, structures, changes in vegetative types, or individual trees and branches.

MEAN WIND SPEED: Average wind speed in a given location over a defined period of time (i.e. annual).

MEGAWATT: A unit of power equalling one million watts.

NACELLE: A component of wind turbine. It is a housing which is mounted on top of the tower and which encloses the drive train and turbine assembly.

NATIONAL REGISTER OF HISTORIC PLACES: The official list, established by the Historic Preservation Act of 1966, of the nation's cultural resources worthy of preservation.

PITCH CONTROL: Mechanism by which blade orientation relative to the wind is changed, thereby altering blade aerodynamics.

TERMS

POWER OUTPUT: For a wind turbine, the amount of power produced at optimum wind speeds, usually expressed in kilowatts or megawatts.

RAPTORS: A group of carnivorous birds, including hawks, eagles, falcons, vultures and owls.

RATED WIND SPEED: Wind speed at which the power output of a turbine reaches its rated value.

RIPARIAN: Situated on/or pertaining to the bank of a river, stream, or other body of water. Normally used to refer to the plants of all types that grow rooted in the watertable of streams, ponds and springs.

ROTOR: The rotating device of a wind turbine that converts wind power into torque on a rotating shaft. Rotors are composed of one or more blades attached to a central hub.

ROTOR ORIENTATION: The placement of the rotor on the drive-train assembly relative to the direction of the wind. A rotor on the side of the assembly which faces the wind is an upwind rotor. If placed on the opposite side, it would be a downwind rotor.

ROTATION SPEED: The speed at which the turbine rotates, expressed in revolutions per minute.

SCALE (VISUAL): The proportionate size relationship between an object and the surroundings in which the object is placed.

SHEET EROSION: Erosion in which thin layers of surface material are gradually removed from an extensive area of gently sloping land by broad sheets of running water rather than streams.

SHUTDOWN: The procedure whereby a wind turbine returns to parked standby status. Shutdown procedures may be initiated by wind speeds exceeding cut-out, wind speeds dropping below cut-in before start-up is complete, by power output falling below prescribed value, or by excessive changes in wind speed or wind direction.

STARTUP: The procedure whereby a wind turbine starts from parked standby status, is made operationally ready, achieves synchronization with the grid and begins to satisfy load. Startup requires several minutes.

TEXTURE (VISUAL): The interplay of light and shadow created by the variation in the surface of an object; the visual result of the tactile surface characteristics.

THREATENED SPECIES: Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

TERMS

TOWER: The structural component of a wind turbine upon which the rotor, drive train assembly and nacelle are mounted.

VERTICAL AXIS TURBINE: A wind turbine in which the rotor rotates about an axis that is vertical with respect to the ground. Hub height for this type of turbine is the height of the mid-point of the rotor.

VISUAL RESOURCE MANAGEMENT: The planning, design, and implementation of visual resource management classes for all BLM resource management activities.

VISUAL RESOURCE MANAGEMENT CLASS: The degree of alteration that is acceptable with the characteristic landscape. The classes are based upon the physical and sociological characteristics of any given homogeneous area.

VISUAL SENSITIVITY LEVEL: An index of the relative importance of value of visual response to an area in relation to other areas.

VOLTS: The unit of electrical potential (electromotive force) equal to the difference of potential between two points in a conducting wire, carrying a constant current of one ampere when the power dissipated between these two points is equal to one watt and equivalent to the potential difference across a resistance of one ohm when one ampere is flowing through it.

WATT: The absolute unit of power equal to the rate of work represented by a current of one ampere under a pressure of one volt.

WILDERNESS AREA: An area formally designated by Congress as part of the National Wilderness Preservation System. Also, an area formally designated as part of the State of California's Wilderness Preservation System.

WILDERNESS NONSUITABILITY: A management recommendation, based on the application of wilderness suitability criteria, that the best use of the resources comprising a Wilderness Study Area would be met without designation of the WSA as a component of the National Wilderness Preservation System, permitting uses which might not necessarily be compatible with Wilderness values.

YAW: To turn a horizontal axis about a vertical axis.

LITERATURE CITED

- Adams, Woody. Desert Water Agency. Personal Communication, February 19, 1982.
- Ainsworth, Keith. Asst General Manager Coachella Valley Water District. Personal communication, February 19, 1982.
- Avery, M.L. (ed.) 1978. Impacts of Transmission Lines on Birds in Flight: Proceedings of a Workshop. U.S. Fish and Wildlife Service, Biological Services Program, Washington, D.C. (U.S. Government Printing Office Stock No. C24-010-00481-9).
- Avery, M.L., P.F. Spriager, and N.S. Dailey. 1978. Avian Mortality at Manmade Structures: An Annotated Bibliography. U.S. Fish and Wildlife Service, Biological Services Program. FWS/OBS-78-58.
- Avise, J.C. and R.L. Crawford. 1981. Natural History, Vol 90, No 9, "A Matter of Lights and Death. September 1981.
- Baker, N.W. 1971. Observations on the Biology of the Giant Palm-boring Beetle, Dinopate Wrightii Horn (Coleoptera: Bostrichidae). pp 31-42. J. New York Entomol. Society Vol. 69, No. 1.
- Bean, Lowell John and Vane, Sylvia Brakke. 1978. Persistence and Power. A Study of Native American People in the Sonoran Desert and the Devers - Palo Verde High Voltage Transmission Line, Southern California Edison, Rosemead.
- Berry, K.H., and L. Nicholson. 1979 Draft. "The Status of the Desert Tortoise in California." USDI, Bureau of Land Management, Riverside, California.
- Bronsen, William. 1971. California Health, pp. 29, October 1971 (Cited: Wagstaff and Brady 1982).
- California Dept. of Fish and Game. 1980. "At the Crossroads. A Report on the Status of California's Endangered and Rare Fish and Wildlife." State of California, Resources Agency, Fish and Game Commission and Dept. of Fish and Game. Sacramento, California.
- County of Riverside, and USDI, Bureau of Land Management. March 1982. San Geronio Wind Resource Study Draft EIR/EIS. Wagstaff and Brady, and Robert Odland Associates.
- County of Riverside and the USDI, Bureau of Land Management. May, 1981. San Geronio Pass Wind Program: A Report on Public Involvement in Identification of the Issues.
- California Energy Commission. January 1981. Electricity Tomorrow-1981 Final Report (biennial report).
- California Energy Commission. 1980. Commission Decision and Final Report on Southern California Edison's Notice of Intention to file an Application for Certification of the California Coal Project. pp. A-15. California Energy Commission, Sacramento, California.

California Energy Commission. 1980. Solar/wind Programs. Final Environmental Impact Report. California Energy Commission, Sacramento, California.

Campbell, B., and R. Remington. 1981. Wildlife Society Bulletin, Vol. 9, No. 1 "Influence of Construction Activities on Water-use Patterns of Desert Bighorn Sheep.

Campbell, Don. Riverside Public Utilities Department. Personal communication, February 9, 1982.

Department of Agriculture, Soil Conservation Service, in cooperation with the University of California Agricultural Experiment Station. 1980. Soil Survey of Riverside County California, Coachella Valley Area, September 1980.

Dunstan, T.C., J.H. Harper, and K.B. Phipps. 1978. "Habitat Use and Hunting Strategies of Prairie Falcons, Red-tailed Hawks, and Golden Eagles." USDI, Bureau of Land Management, Denver, Colorado.

Electric Power Research Institute, 1979. Proceedings of the Workshop on Economic and Operational Requirements and Status of Large Scale Wind Systems. pp 95-109 Report No. ER-1110-SR. Palo Alto, California.

Elliot, D. 1904. Field Columbian Museum Publication 91, pp. 271-321, Zoological Series, Vol. 3. "Catalogue of Mammals Collected by E. Heller in Southern California."

Energy and Environmental Analysis, Inc. 1980. Final Programmatic Environmental Assessment of the U.S. Department of Energy's Wind Energy Conversion Program. Energy and Environmental Analysis, Inc., Arlington, Virginia.

England, A.S. and S.G. Nelson. 1976. "Status of the Coachella Valley Fringetoe Lizard (Uma inornata).". State of California, Dept. of Fish and Game, Inland Fisheries Administrative Report No. 77-1.

Fletcher, J.L. and Busnel, R.G., eds. Effects of Noise on Wildlife pp 81-104. Academic Press, New York, New York.

Goldwasser, S., D. Gaines, and S.R. Wilbur. 1980. American Birds, pp. 742 - 745, Vol. 34, No. 5. "The Least Bell's Vireo in California: A de facto endangered race."

Goldwasser, S. 1978. Distribution, Reproductive Success and Impact of Nest Parasitism by Brown-headed Cowbirds on Least Bell's Vireo. California Department of Fish and Game, Sacramento.

Hall, E.R. and K.R. Kelson. 1959. The Mammals of North America. Ronald Press, New York.

Harmata, A.R., J.E. Durr, and H. Geduloig. 1978. "Home Range, Activity Patterns and Habitat use of Prairie Falcons Nesting in the Mojave Desert." Prepared by Colorado Wildlife Services, Fort Collins, Colorado, for the USDI, Bureau of Land Management, Riverside, California.

- Jaeger, E.C. 1941. Desert Wild Flowers. Stanford University Press, Stanford, Calif. Rev. Edition.
- Jorgensen, P. 1974. Transcript - Desert Bighorn Council, pp. 18-24, "Vehicle Use at a Desert Bighorn Watering Area."
- Kibbee, Ray. Desert Hot Springs County Water District. Personal communication, February 18 and 19, 1982.
- La Pre', L. and J. Cornett. 1981. "Public Lands Survey for the Coachella Valley Fringe-toed Lizard." Report to the USDI, Bureau of Land Management, Riverside, California.
- Latting (ed.). "The California Desert: An Introduction to Natural Resources and Man's Impacts." California Native Plant Society Special Public No. 5.
- McCrary, M.D., R.L. McKernan, and R.W. Schreiber. 1981. "Nocturnal Bird Migration in the Coachella Valley - Spring 1981." Preliminary Report. Southern California Edison Research and Development, Rosemead, California.
- McCutchen, H.E. 1981. Wildlife Society Bulletin p. 171-179, Vol 9, No. 3, 1981.
- McKernan, R.L. and R.W. Schreiber. In Preparation. "A Study of Diurnal Utilization and Migration by Birds in the San Geronio Pass and Adjacent Desert Areas of Southern California." Los Angeles Natural History Museum Foundation, Los Angeles, California.
- Meir, R.W. and T.J. Merson. 1980. Technology Assessment of Wind Conversion Systems. Report No. DOE/EV-0103. National Technical Information Service, Springfield, Virginia.
- Munz, P. 1974. A Flora of Southern California. University of California Press, Berkeley, CA.
- Norris and Carrico, Personal communication.
- Olendorff, R.R., A.D. Miller, and R.N. Lehman. 1981. Suggested Practices for Raptor Protection on Power Lines, the State of the Art in 1981. Raptor Res. Rep. No. 4.
- Rado, T. Unpublished Report.
- Rado, Ted. 1981. Analysis of Actual and Potential Loss of Flat-tailed Horned Lizard (Phrynosoma mcallii) Habitat. USDI, Bureau of Land Management, Riverside, California.
- Risenhoover, K.L., and J.A. Bailey. 1980. Transactions of the Northern Wild Sheep and Goat Conference, "Visibility: An Important Habitat Factor for an Indigenous, Low Elevation bighorn herd In Colorado." Bureau of Land Management files, Riverside, California.
- Schreiber, R.W., R.L. McKernan, et al. 1982. Ornithological Behavioral Studies: Radar and Visual Study of Nocturnal Bird Migration in the San Geronio Pass, Salton Sea and San Jacinto Valley of Southern California (a proposal). Natural History Museum of Los Angeles County, Los Angeles, California.

Smith, J.P., Jr. (ed.). 1981. Inventory of Rare and Endangered Vascular Plants of California, First Supplement. Special Publication No. 1, 2nd Edition, California Native Plant Society, Berkeley, California.

Smith, J.P. Jr., R.J. Cole, J.O. Sawyer, Jr., 1980. Inventory of Rare and Endangered Vascular Plants of California. Special Publication No. 1 2nd Edition. California Native Plant Society, Berkeley, California.

Stebbins, R.C. 1944. Ecological Monographs Vol. 14 pp. 311-332, "Some Aspects of the Ecology of the Iguanid Genus Uma".

Tevis, L., Jr. 1959. Transaction of the Desert Bighorn Council, 1959, pp. 69-74. "Man's Effect on Bighorn in the San Jacinto-Santa Rosa Mountains of California."

Tevis, L., Jr., and I.M. Newell. 1962. Ecology, pp. 497 - 505 "Studies on the Biology and Seasonal Cycles of the Giant Red Velvet Mite, (Acari: Trombididae)." Vol. 43 No. 3.

Turner, F.B., P.A. Medica, and H.O. Hill. 1978. "The Status of the Flattailed Horned Lizard (Phrynosoma mcallii) at Bine Sites in Imperial and Riverside Counties, California" (Report on Contract No. YA-512-CT8-58) USDI, Bureau of Land Management, California Desert Program, Riverside, California.

Turner, F.B., J.C. Rorabaugh, E.C. Nelson and M.C. Jorgensen. 1980. A Survey of the Occurrence and Abundance of the Flat-tailed Horned Lizard (Phrynosoma mcallii) in California. Report for Contr. YA-512-CT8-58. USDI, Bureau of Land Management, California Desert Program, Riverside, California.

Turner, F.B., D.C. Weaver, and J.C. Rorabaugh. 1981. "Field notes from the study: The abundance of the fringe-toed lizard (Uma inornata) at 10 sites in the Coachella Valley." Laboratory of Nuclear Medicine and Radiation Biology, University of California, Los Angeles, California. 90024.

U.S Army Corps of Engineers, Los Angeles, District. The Effect of Blowsand Reduction on the Abundance of the Fringe-toed Lizard (Uma inornata) in the Coachella Valley, pp. 1-63, "Fringe-toed Lizard (Uma inornata) at 10 Sites in the Coachella Valley, California."

U.S. Army Corps of Engineers, Los Angeles District. Part II. The Effect of Blowsand Reduction on the Abundance of the Fringe-toed Lizard (Uma inornata) in the Coachella Valley, California. pp. xi-180.

United States Army Corps of Engineers. 1977. Water Resources Development in California, Division Engineer, South Pacific Division, San Francisco, CA. 1977.

United States Department of Energy. 1978. Environmental Readiness Document, Large and Small Wind Systems. Report No. DOE/ERD-0006. National Technical Information Service, Springfield, Virginia.

United States Department of Energy. 1978. Environmental Development Plan, Wind Energy Conversion. Report No. DOE/EDP-0007. National Technical Information Service, Springfield, Virginia.

U.S. Department of Energy. 1980. "Nuclear Energy, Conservation, and Solar Energy, Report No. CONF-800334/2. National Technical Information Service, Springfield, Virginia.

USDI, Bureau of Land Management. 1980. Pacific Crest National Scenic Trail Management Options Plan.

USDI, Bureau of Land Management. 1982. The Cahuilla and the Santa Rosa Mountain Region: Places and their Native Association.

USDI, Bureau of Land Management. 1980. The California Desert Conservation Area, Final Environmental Impact Statement and Proposed Plan. Riverside, California.

USDI, Bureau of Land Management, 1980. The California Desert Conservation Area Plan. Desert District, Riverside, California.

USDI, Bureau of Land Management. 1980. Whitewater Canyon Area of Critical Environmental Concern (Proposal). California Desert Plan Program files, Riverside, California. Loose leaf report.

USDI, U.S. Fish and Wildlife Service. 1981. "Coachella Valley Fringe-toed Lizard Recovery Plan." Technical Review Draft prepared by the Coachella Valley Fringe-toed Lizard Advisory Committee. Sept. 4, 1981. Sacramento, California.

USDI, U.S. Fish and Wildlife Service. 1981b. Federal Register Vol. 45: p. 82480-82569, December 15, 1980.

Warner, R. (e.d.). Proc. of the

Weaver, D.C. 1979. Assessment of Effects of Flood Control Alternatives on Blowsand Conditions in the Coachella Valley, Whitewater River Basin. Prepared for U.S. Army Corps of Engineers, Los Angeles District.

Weaver, Richard A., and Jerry L. Mensch. 1970. Bighorn Sheep in Southern Riverside County, California. Department of Fish and Game. Wildl. Mgmt. Adm. Rpt. No. 70-5.

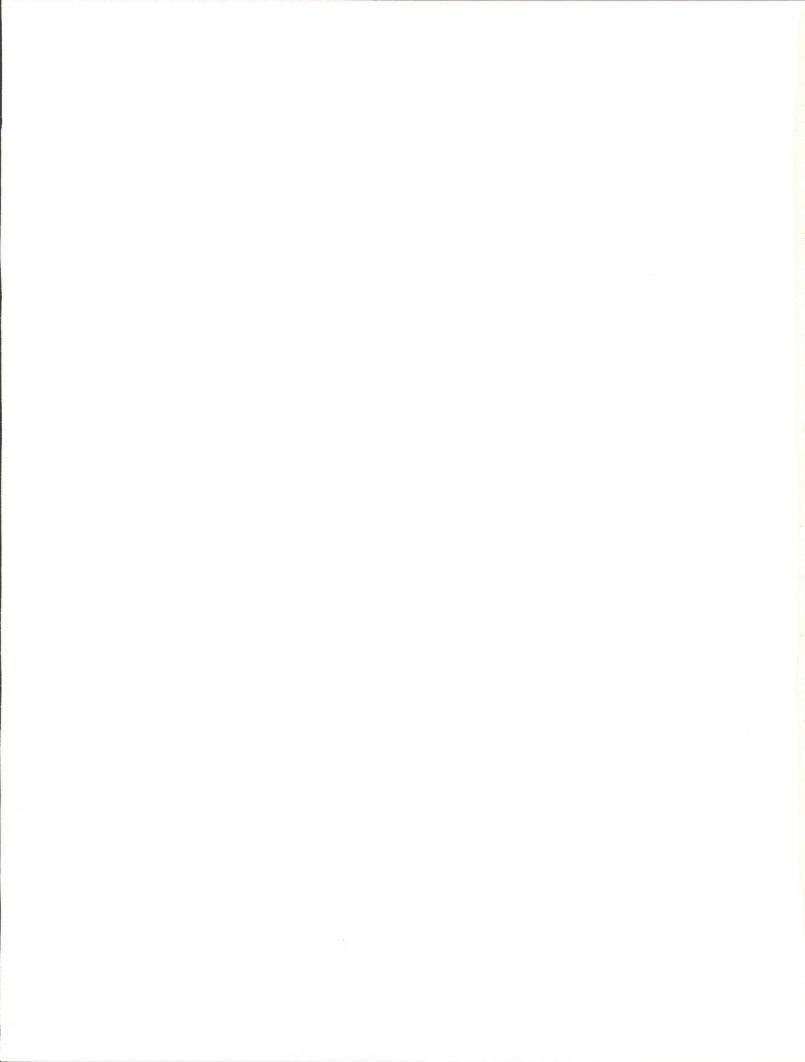
Weaver, R.A. Encroachment into Desert Bighorn Sheep Habitat and Compensating Management Techniques. California Dept. Fish and Game. Bureau of Land Management Files, Riverside, California.

Weaver, R.W., J.L. Mensch, W. Timmerman, and J.M. Hall. 1972. California Dept. of Fish and Game, Wildlife Management Administrative Report No. 72-2. "Bighorn Sheep in the San Gabriel and San Bernardino Mountains." Sacramento, California

Windfarms, Ltd. 1982. "Solano Windfarm Project Use Permit Application. Volume I." pp. 3.4-7 to 3.4-21. Application submitted to the County of Solano (California) Planning Department, January 20, 1982. Windfarms, Lt., San Francisco, California.

BLM LIBRARY
RS 150A BLDG. 50
DENVER FEDERAL CENTER
P.O. BOX 25047
DENVER, CO 80225

APPENDICES



APPENDIX A

TIME TABLE OF CONSTRUCTION ACTIVITIES

FIGURE A-1

Windfarms Construction Schedule

DATE	1983												1984												1985						
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Site Survey & Soil Samples	X	X				Phase I								X	X	X	X		Phase II												
General Site Preparation	X	X	X	X	X																										
Road/WTG Site Development			X	X	X	X	X	X	X	X						X	X	X	X	X	X	X	X						X	X	X
WTG Site Foundations							X	X	X	X	X	X							X	X	X	X	X	X	X	X					
Electrical Collection System							X	X	X	X	X	X	X										X	X	X	X					
Transmission Interconnection/ Switchyard											X	X	X	X	X	X	X	X													
Project Support Facilities											X	X	X	X	X	X	X	X													
WTG Erection											X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
WTG Start-up																	X	X	X	X	X	X	X	X	X	X	X				X

FIGURE A-1
(Continued)

1986												1987												1988													
Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Phase III												Phase IV																									
X	X	X	X			X	X	X	X	X	X	X	X	X	X																						
	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X																
			X	X	X	X	X							X	X	X	X	X	X																		
				X	X	X	X							X	X	X	X	X	X	X																	
			X	X	X	X	X							X	X	X	X	X	X																		
X	X	X	X	X	X						X	X	X	X	X										X	X	X	X	X	X	X	X	X	X	X	X	

FIGURE A-2

U.S. Windpower Construction Schedule

DATE	1982												1983												1984											
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan					
<u>Key Activities for first 100 Windmills</u>																																				
Site Survey		X	X																																	
Service Road Installation				X	X	X																														
Tower Site Preparation & Foundation Installation				X	X	X																														
Power Collection System Installation						X	X	X																												
Tower Assembly & Erection							X	X	X	X	X																									
Turbine Installation								X	X	X	X	X																								
Blade Installation									X	X	X	X	X																							
Interconnection & Check-Out										X	X	X	X	X																						
<u>Operational</u>																																				
First 100 WTGs												X	X	X																						
Remaining Phase-1 (WTGs) (50 per month)													X	X	X	X	X	X	X	X	X															

End Phase 1

Phases 2 and 3 would follow a similar sequential schedule with Phase 2 taking place between the 29th and 35th months after land allotment and Phase 3 occurring between the 36th and 65th months after land allotment. If deemed desirable, it would be possible to accelerate this schedule by increasing the crews described in the Construction Activities description above.

FIGURE A-3

SCE-Boeing Construction Schedule

DATE	1982												1983												1984																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
Contract Award	X																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											

FIGURE A-4

SCE-Bear Sterns/Bendix Construction Schedule

DATE	1982												1983												1984											
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan					
Contract Award	X																																			
Engineering	X																																			
Procurement	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																		
Site Activity																																				
Foundations				X	X	X	X																													
Erect/Install/Accept							X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X											

FIGURE A-5

SCE-WECS Tech Construction Schedule

DATE	1982												1983												1984											
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan					
Contract Award	X																																			
Engineering	X																																			
Procurement	X	X	X	X	X	X																														
Site Activity																																				
Foundations		X	X	X	X	X	X	X																												
Erect/Install/Accept				X	X	X	X	X	X	X	X	X	X	X	X	X																				

FIGURE A-6

SCE-Westinghouse Construction Schedule

DATE	1982												1983												1984											
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan					
Contract Award	X																																			
Engineering	X	X	X	X	X																															
Procurement	X	X	X	X	X	X	X																													
Site Activity																																				
Foundations						X	X	X	X	X	X	X	X																							
Erect/Install/Accept													X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					

FIGURE A-7
SCE-Ventus Construction Schedule

DATE	1982												1983												1984											
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan					
Contract Award	X																																			
Engineering	X	X	X	X	X	X	X	X																												
Procurement							X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X												
Site Activity																																				
Foundations													X	X	X	X																				
Erect/Install/Accept																X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		

FIGURE A-8

PanAero Construction Schedule

DATE	1982												1983												1984											
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan					
Preconstruction Activities																																				
Obtain Right of Way Permit	X																																			
Wind Data Collection			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																
Wind Data Analysis								X	X	X	X	X	X	X	X	X	X	X	X	X																
Obtain Construction Permit								X	X																											
Construction Program																																				
Transmission Lines																					X	X	X	X	X											
Transformers, Switchyards, Substations																										X	X	X	X							
Access Roads								X	X	X	X	X	X	X																						
Turbine Site Preparation											X	X	X	X	X	X	X	X	X	X																
Installation of Turbines														X	X	X	X	X	X	X	X	X	X	X	X											
Control Center																									X	X	X									
Testing of Complete Facility																										X	X	X	X							

Stage II

Will start after Stage I is completed with approximately the same time frames as above.

FIGURE A-9

San Geronio Farms Construction Schedule

DATE	1982												1983												1984											
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan					
	Phase 1												Phase 2																							
Site Survey-Soil Tests	X	X	X																																	
Service Road Construction			X	X	X	X									X	X	X	X																		
Site Preparation and Foundation Installation				X	X	X	X									X	X	X	X	X	X															
Power Collection System Installation					X	X	X	X									X	X	X	X																
Erection of Turbine						X	X	X	X											X	X	X	X	X												

FIGURE A-10

City of Riverside Construction Schedule

DATE	1982		1983				1984				1985				1986				1987				1988				1989				
	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Dec				
Anemometers			X																												
Interpret Data				X	X	X	X																								
Site Survey					X	X	X																								
Road and WTG Site Development							X	X	X																						
WTG Site Foundation									X	X							X	X	X						X	X					
Maintenance/Control Center										X	X																				
Underground 4 kV Cable										X	X						X	X							X	X					
Overhead 12 kV Line										X	X																				
WTG Erection											X	X	X						X	X						X	X	X			
WTG Start-Up													X	X					X	X	X						X				
Expansion of Control Center																			X												
Phase I																Phase II								Phase III							

APPENDIX B Wind Turbine Specifications

Feature	Bendix BX-WTG-U	Hamilton Standard WTS-4	Boeing MOD-2	Merkham 2000	DAF Indal	Westinghouse WWG-0500
Power Output	4500 kw	4000 kw	2500 kw	2000 kw	500 kw	500 kw
Rated Wind Speed	34 mph	36 mph	28 mph	Unknown	43 mph	27 mph
Rotation Speed	25 rpm	30 rpm	18 rpm	36 rpm	45 rpm	42 rpm
Blade Tip Speed	339 ft/sec	404 ft/sec	275 ft/sec	226 ft/sec	188 ft/sec	275 ft/sec
Out-in Speed	10 mph	16 mph	14 mph	5 mph	16 mph	14 mph
Out-out Speed	55 mph	60 mph	60 mph	40 mph	80 mph	50 mph
Rotor Orientation	Upwind	Downwind	Upwind	Downwind	Vertical	Downwind
Generator RPM	1800 rpm	1800 rpm	1800 rpm	Unknown	1200 rpm	1800 rpm
Generator Type	Induction	Synchronous	Synchronous	Induction	Induction	Synchronous
Gearbox Step-Up Ratio	73:1	60:1	103:1	Unknown	27:1	43:1
Gearbox Type	Epicyclic	Epicyclic	Planetary	Unknown	Parallel Shaft	Planetary
Total Height	310 ft	391 ft	350 ft	180 ft	120 ft	163 ft
Tower Height	180 ft	252 ft	193 ft	100 ft	120 ft	100 ft
Rotor Diameter	260 ft	256 ft	300 ft	160 ft	80 ft	125 ft
Rotor Weight	60,000 lbs	110,000 lbs	189,000 lbs	1,360 lbs	4,400 lbs	5,200 lbs
Rotor Blade Material	Composite	Fiberglass	Steel	Aluminum	Aluminum	Wood/Fiber-glass
Foundation	58 ft across flats; 10 ft deep	Footing: 60 ft sq, 5 ft deep. Ped- estal tap- ered: 32 ft top, 5 ft deep	Footing: 66 ft diam. octa- gon, 6 ft deep Pedestal 32 ft diam. octagon, 4.7 ft deep	48 ft sq 9 ft deep	Single Caisson 4 ft deep	Multiple Cais- son 26 ft sq, Guy wire foot- ing 3'x10'x8'
Foundation Weight	443 mil lbs	3.1 mil lbs	3.2 mil lbs	998,000 lbs	Unknown	390,000 lbs

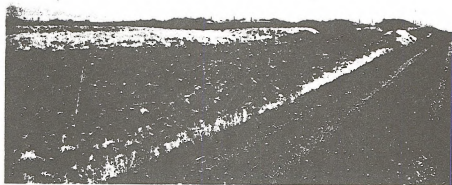
APPENDIX B (Continued)

Feature	Carter CWG-125	WECS Tech WT-605-HAWT	Weecs Tech Mark 1605	Windpower USW-56-50	Ventus*	Carter CWG-25
---------	-------------------	--------------------------	-------------------------	------------------------	---------	------------------

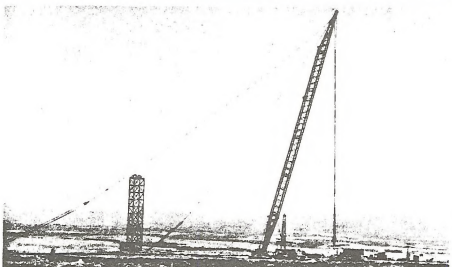
Power Output	125 kw	100 kw	100 kw	50 kw	37.5 kw	25 kw
Rated Wind Speed	31 mph	28 mph	28 mph	22 mph	30 mph	26 mph
Rotation Speed	75 rpm	60 rpm	60 rpm	72 rpm	107/214 rpm	120 rpm
Blade Tip Speed	255 ft/sec	206 ft/sec	188 ft/sec	210 ft/sec	174/347 ft/sec	200 ft/sec
Cut-in Speed	9 mph	12 mph	Unknown	10 mph	12.5 mph	7.5 mph
Cut-out Speed	None	Unknown	Unknown	44 mph	50 mph	None
Rotor Orientation	Downwind	Downwind	Downwind	Downwind	Downwind	Downwind
Generator RPM	1838 rpm	1800 rpm	1800 rpm	1800 rpm	900/1800 rpm	1800 rpm
Generator Type	Induction	Induction	Induction	Induction	Induction	Induction
Gearbox Step-Up Ratio	24:1	125:1	125:1	25:1	8.5:1	15:1
Gearbox Type	Planetary	Conventional	Conventional	Conventional	Helical	Double Reduction
Total Height	155 ft	110 ft	110 ft	90 ft	102 ft	96 ft
Tower Height	120 ft	75 ft	75 ft	60 ft	100 ft	80 ft
Rotor Diameter	65 ft	58 ft	58 ft	56 ft	31 ft	32 ft
Rotor Weight	800 lbs	750 lbs	350 lbs	N/A	880 lbs	200 lbs
Rotor Blade Material	Fiberglass	Aluminum/Dacron	Aluminum/Dacron	Fiberglass	Composite	Fiberglass
Foundation	Spread-Anchor 4'x 6'x5' footing 5 ft sq, 2.5 ft deep	8 ft sq, 2 ft deep Guywire footing 5 ft sq, 2.5 ft deep	8 ft sq, 2 ft deep, Guy wire footing 5 ft sq 2.5 ft deep	Piers, 2.5 ft diam, 7 ft deep	6 ft sq, 6 ft deep	Spread Anchor 2'x6'x5' Guy wire foot- ing 3'x6'x5'
Foundation Weight	Wt of 45 cu. yds concrete	56,400 lbs All Foundations	56,400 lbs (All Foundations)	Unknown	31,000 lbs	Weight of 10 cu. yds concrete

*Four turbines per tower

On-Site Construction (SOURCE: WINDFARMS, LTD)

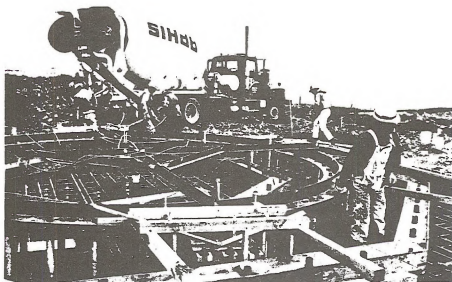


October, 1979. The National Aeronautics and Space Administration and U.S. Department of Energy choose an empty field on a back country road as the future home of the MOD-2 wind turbines. Three years of meteorological testing conducted by Oregon State University for BPA had shown this area to be admirably suited for large-scale power generation with wind turbines.

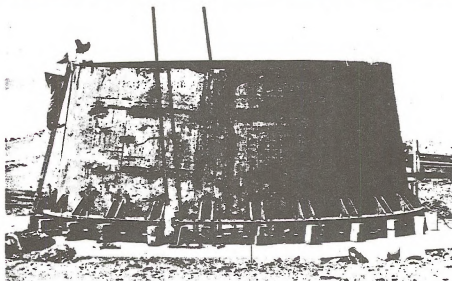


June, 1980. Construction is well underway. The 240-foot gin pole, secured and manipulated by steel cables, will lift different sections of the MOD-2 into place. The short lattice structure on the left "cradles" the gin pole when it is not in use.

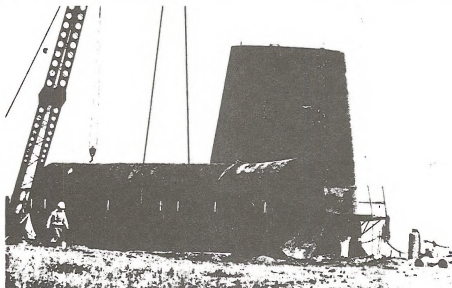
May, 1980. Pouring the foundation for the first MOD-2 unit. Bolts reaching 29 feet into bedrock and 400 cubic yards of concrete anchor the MOD-2 securely to the Goodnoe Hills.

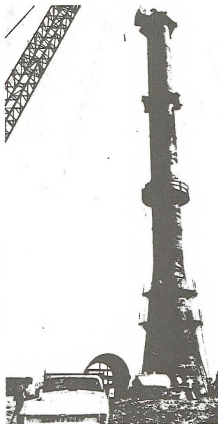
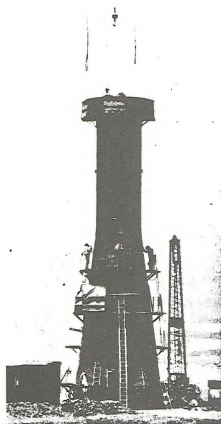


The base of the tower is bolted to the buried foundation.

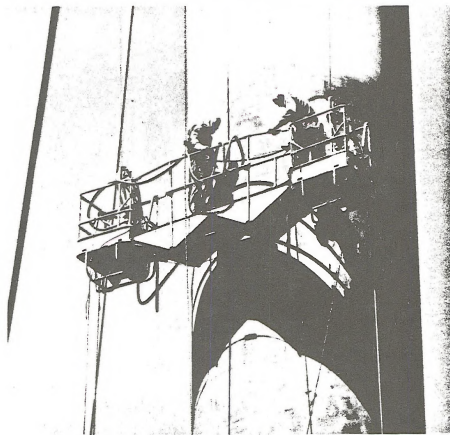


July, and the first tower rises from the earth.



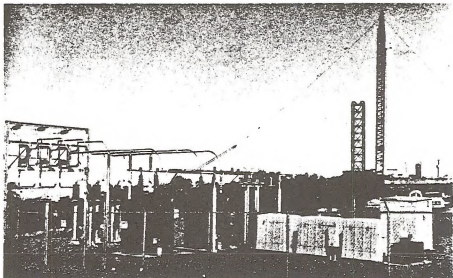


Left: Screens shelter welders from the wind, which tends to blow out their torches.

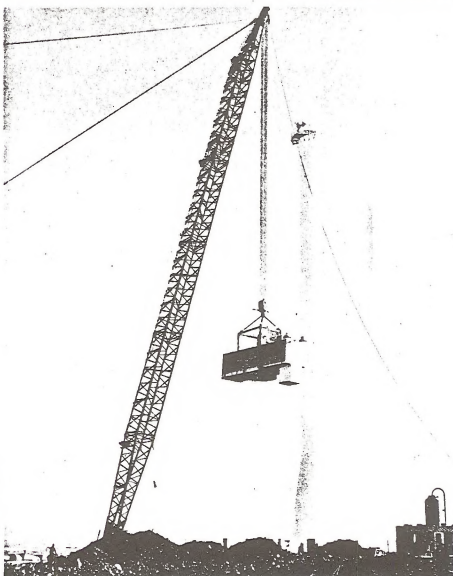


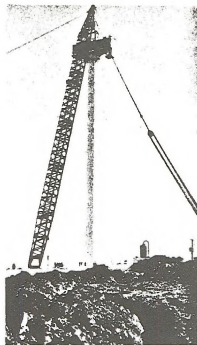
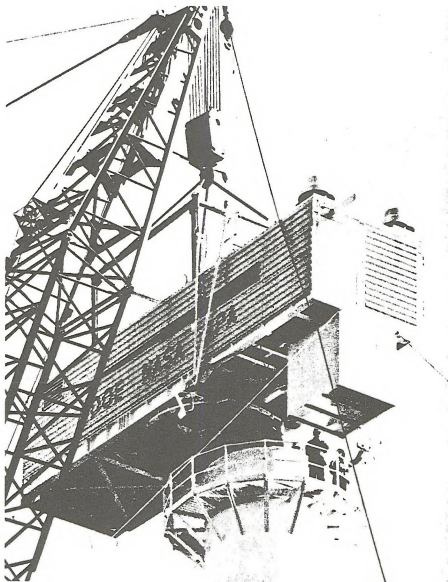
Painting the tower. The nacelle and blades are painted before being lifted into place, but the tower must be painted after it's welded together, by crewmen hanging from the top like window washers.

While Boeing builds the wind turbines, BPA erects a small substation, which raises voltage from the wind turbines from 12.5 kilovolts to 69-kV, and integrates the wind power with the Northwest electric grid. By mid-summer 1980, the substation is complete.

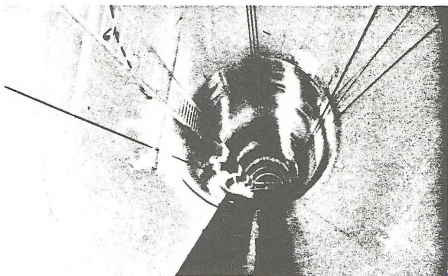


September, 1980. Hoisting the first nacelle. The 92-ton box, packed with generator, gearbox, and computer, rises slowly 193 feet to the top of the tower on a nearly windless day. The box is about the same size as a semitrailer. It contains all the major moving parts of the wind turbine except the rotor, with room enough for most maintenance jobs, including overhaul of the gearbox.



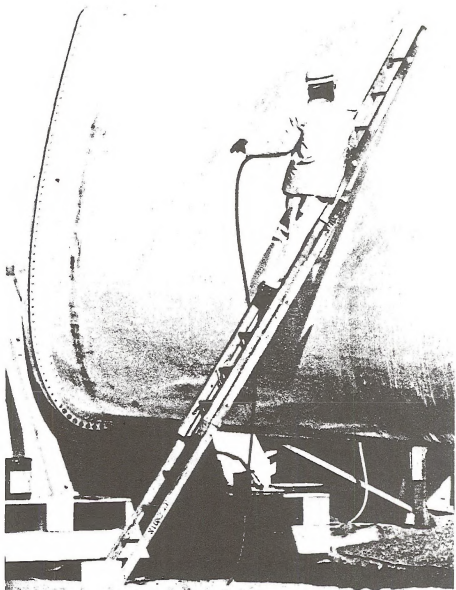


Left: This closeup of the nacelle just before it is guided into place shows some of the details important to the MOD-2's operation. The smooth-sided box hanging below the nacelle counter balances the weight of the rotor and holds lubricating oil for the gearbox. Peglike bolts on the yaw-drive ring lock the nacelle to the tower, and permit the nacelle and rotor to swivel 360 degrees to follow the winds. Door at end of the nacelle with protruding steel post above allows crews to lift large tools and equipment to and from the nacelle as needed. Knobs atop nacelle ventilate the generators. Catwalk, used for maintenance, is reached through a trapdoor in the floor of the nacelle.

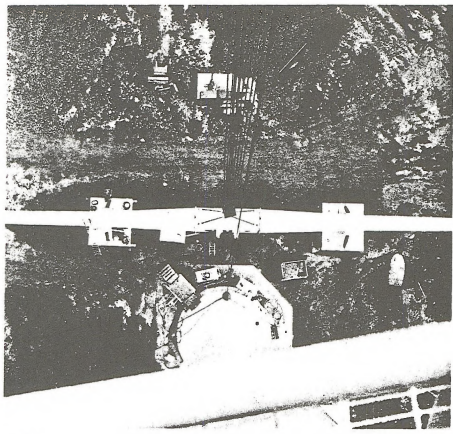


Above: And the nacelle is in place. Trench will hold cables which carry power from the wind turbine to the substation. All power and communication lines between the three wind turbines and the substation are laid below ground.

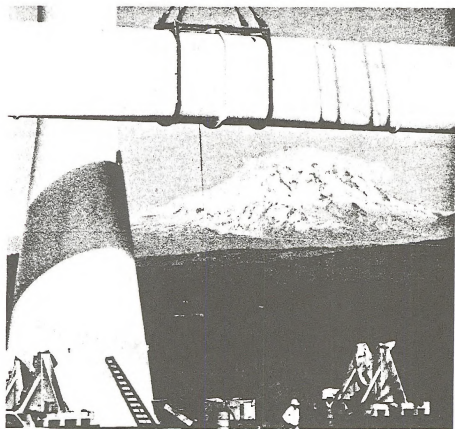
Inside the completed MOD-2 tower, thick cables carry power from the wind generator to the ground, and thinner cables carry computer commands and information. Human access to the top is provided by a ladder and by a "manlift" elevator (not shown).



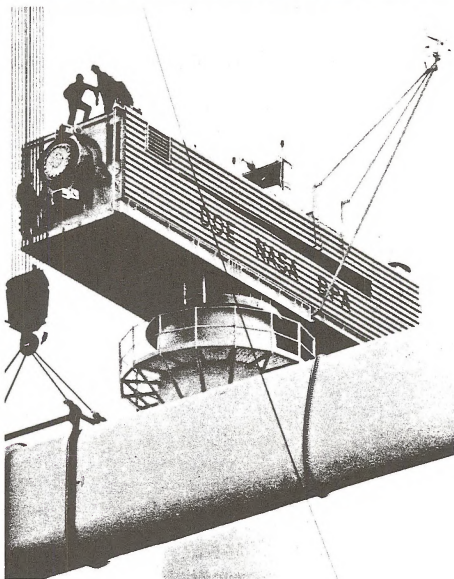
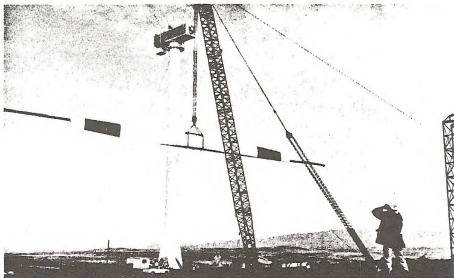
October, 1980. Touching up the paint on Unit 1 blade before lifting. Each of the five sections of the rotor is bolted together with two sets of bolts—an outside row, visible here to the left of the painter, and a second, inside set. Workers climbed inside the rotor through an opening at the hub to secure the inside set.



View from the top ... (Unit 2)

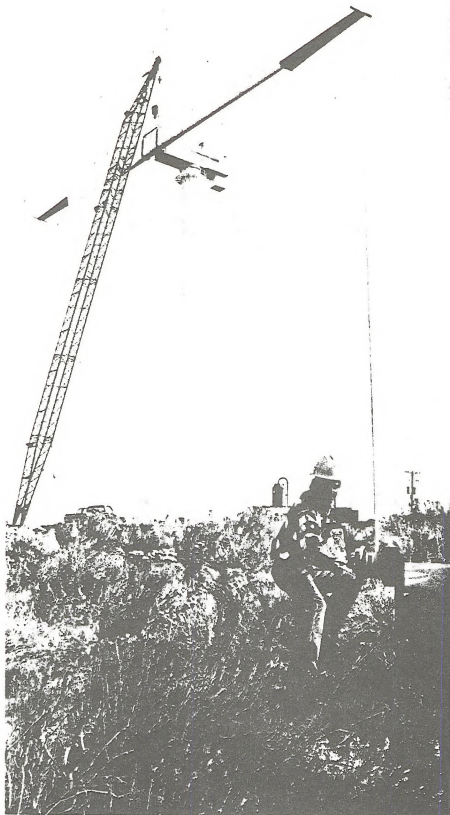


... And the ground, as the rotor of Unit 3 rises against a clear view of Mt. Adams, April, 1981.



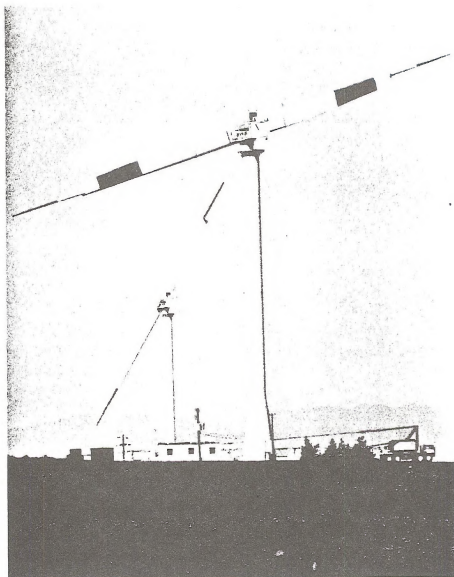
October, 1980. The first rotor rises. Workers wait to secure the rotor to the low-speed shaft with another double row of bolts. A safety line holds worker on lower catwalk secure. He must work between the wall of the nacelle and the rotor to drive the bolts home. This picture also shows clearly one of the wind sensors which detect wind speed and direction on each side of the nacelle and keep the rotor turned into the wind.

Radiator atop the nacelle cools generator lubricant.

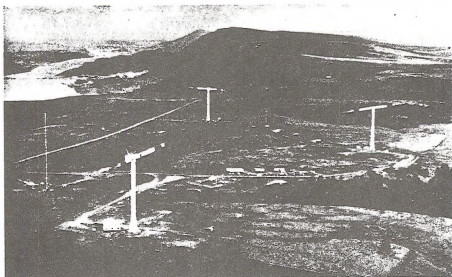


Tie lines at each rotor tip keep the blades steady as the rotor is secured to the drive train in the nacelle. The tie lines are later removed.

Two of three completed wind turbines sport different paint jobs. The Federal Aviation Administration originally specified two international orange stripes as daylight warning markings for the MOD-2. In the construction period, an alternative marking was permitted—orange on the tips alone. It was discovered that when the blades are feathered, the orange tips are difficult to see, so, in April and May, 1981, all the machines were painted to the original FAA specifications.



May, 1981. All three units stand complete above the Columbia River Gorge, less than a year-and-a-half after construction on site started.

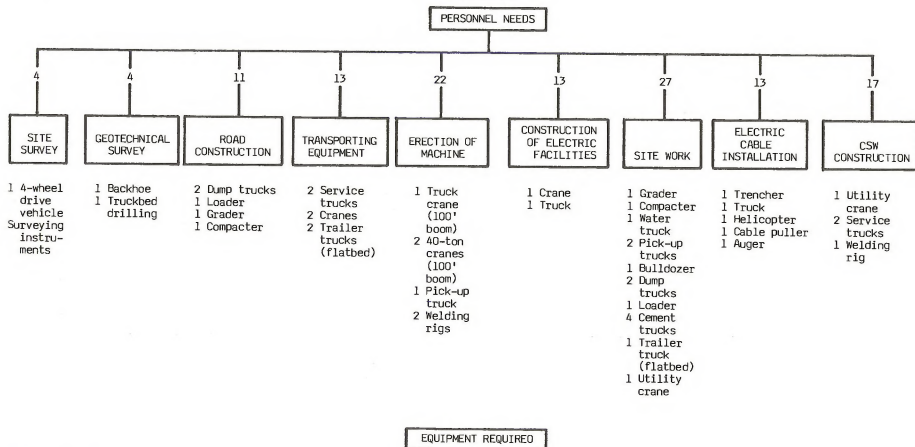


APPENDIX 0

TABLE 0-1

Construction Personnel and Equipment Needs

Windfarms

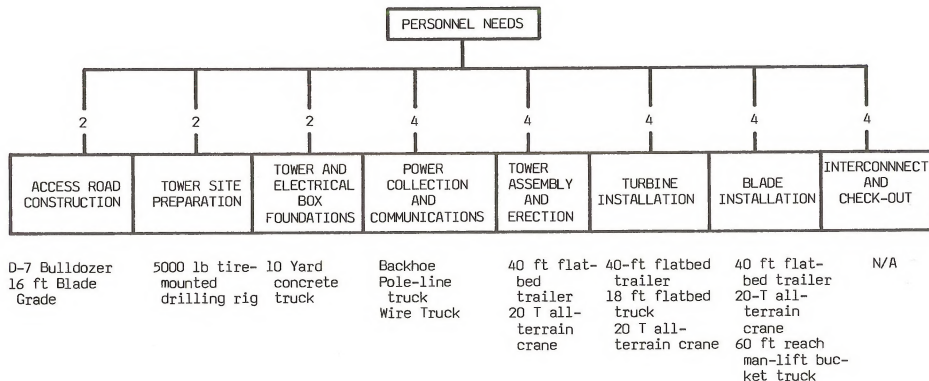


Source: Windfarms

TABLE D-2

Construction Personnel and Equipment Requirements

U.S. Windpower

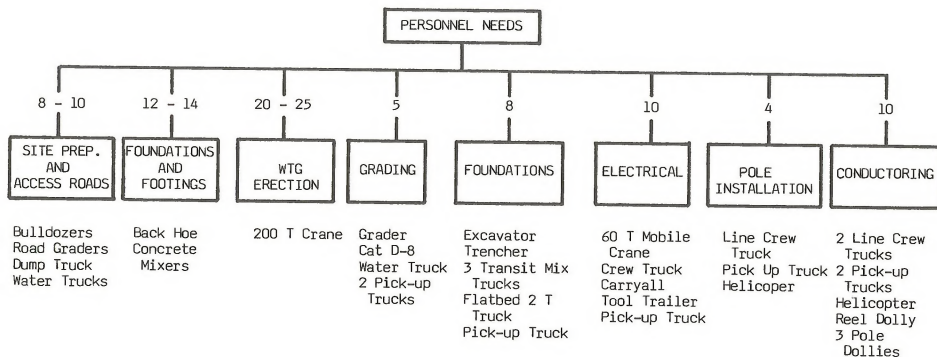


EQUIPMENT REQUIRED

TABLE D-3

Construction Personnel and Equipment Needs

Southern California Edison



ALSO

- Pick-Up Trucks
- Generators
- Air Compressor
- Welding Equipment

EQUIPMENT REQUIRED

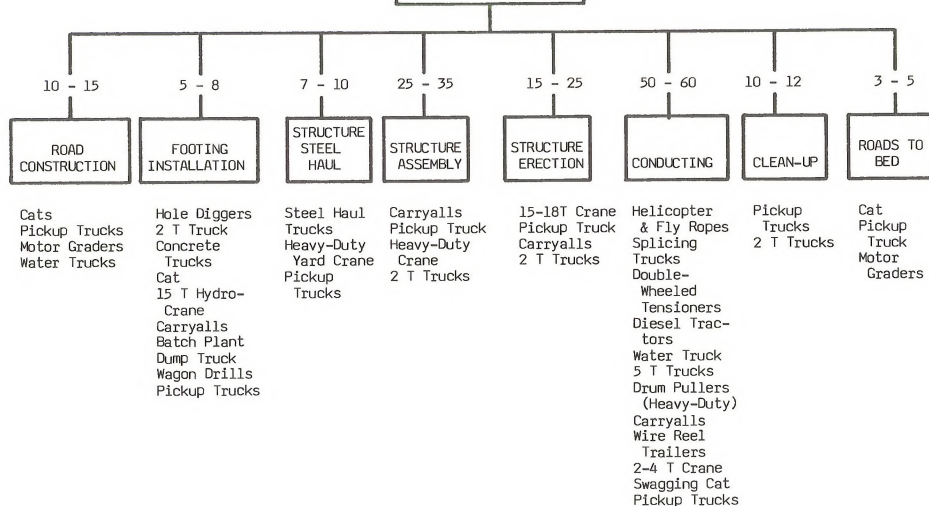
TABLE D-4

Construction Personnel and Equipment Needs

PanAero

PERSONNEL NEEDS

(Total: 125 to 170)



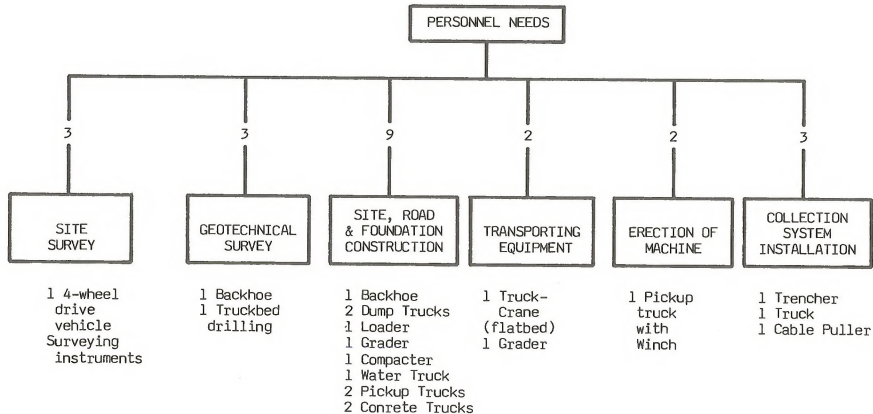
EQUIPMENT REQUIRED

TABLE D-5

Construction Personnel and Equipment Needs

San Geronio Farms

PERSONNEL NEEDS



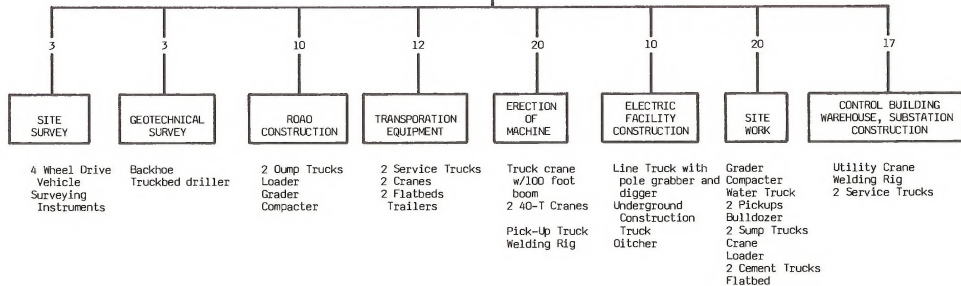
EQUIPMENT REQUIRED

TABLE D-6

Construction Personnel and Equipment Needs

City of Riverside

PERSONNEL NEEDS



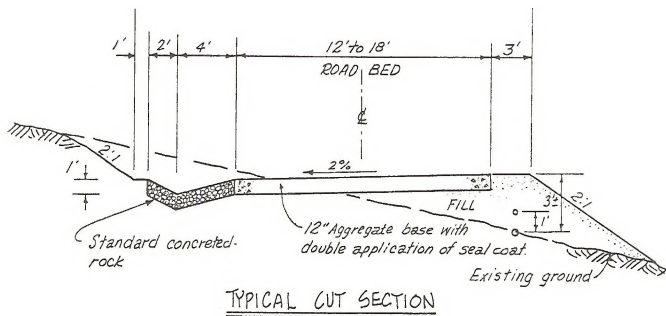
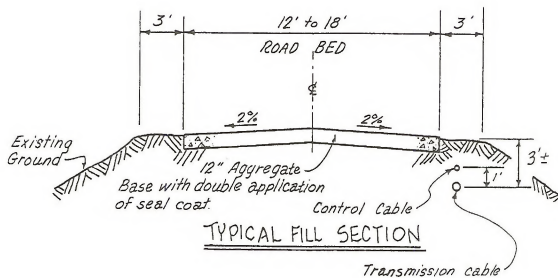
EQUIPMENT REQUIRED

APPENDIX E

Access Road Design and Specifications

FIGURE E-1

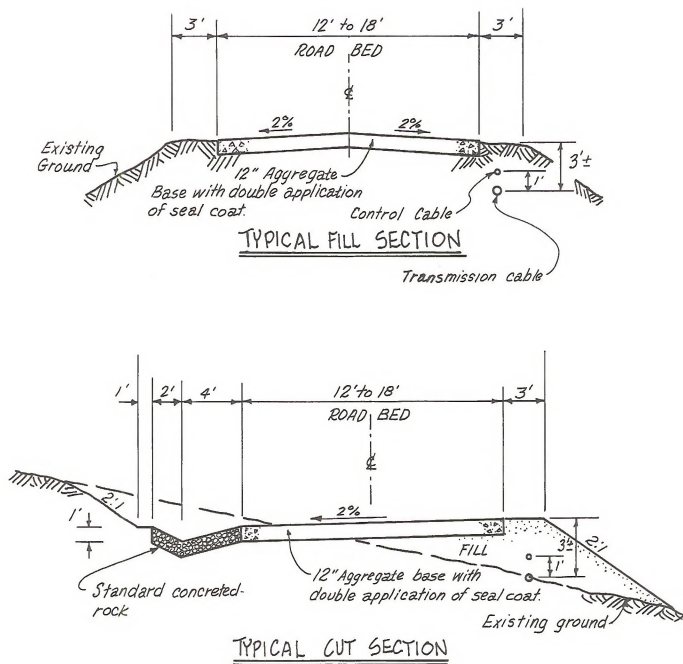
Windfarms



SOURCE: WINDFARMS

ACCESS ROAD DETAIL

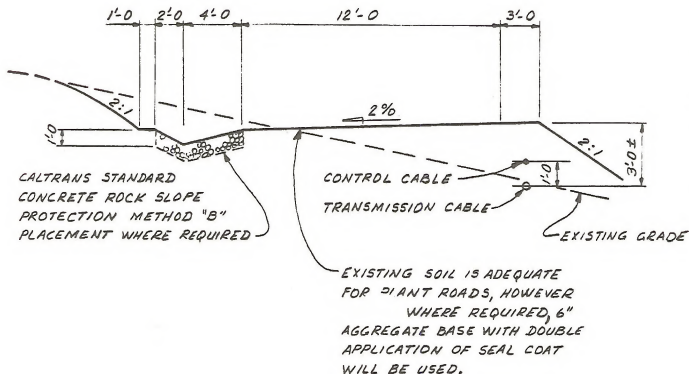
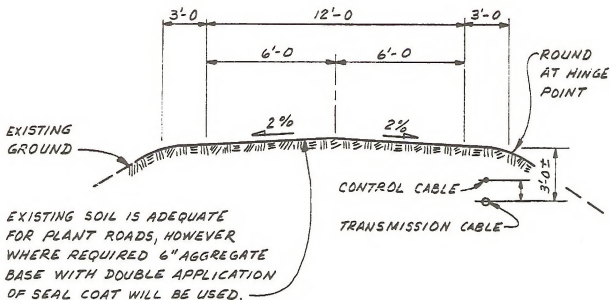
FIGURE E-2
U.S. Windpower



SOURCE: WINDFARMS

ACCESS ROAD DETAIL

Southern California Edison
PLANT ACCESS ROAD



TYPICAL SECTIONS

NO SCALE

FIGURE E-4

Pan Aero

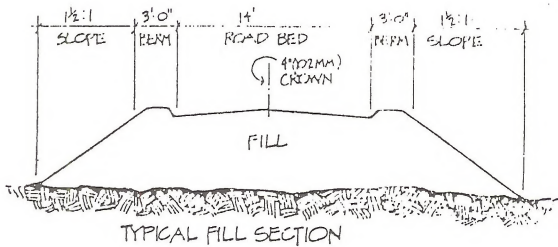
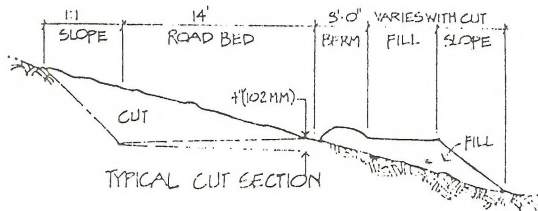
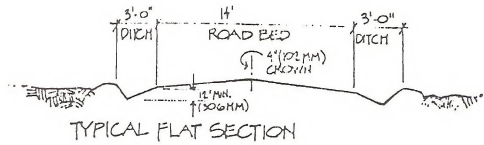
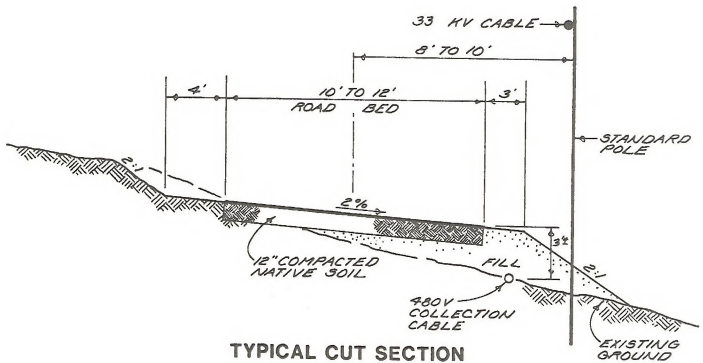
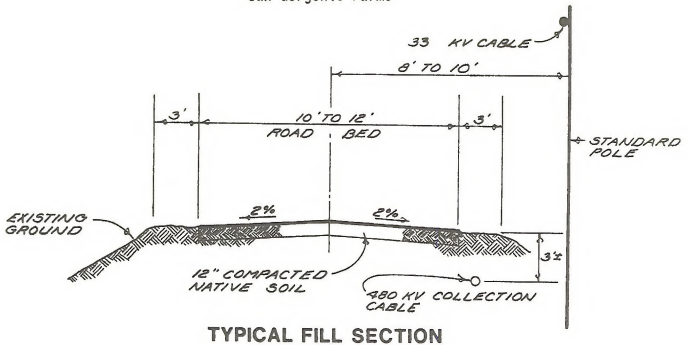


FIGURE E-5

San Gorgonio Farms



SERVICE ROAD DETAIL

TABLE F-1
Windfarms Project
Transmission Line Designs

Underground Transmission

Depth of lines	3 feet
Voltage	34.5 kV
Average Number of Machines per line	8 (MOO-2) or 6 (WTS-4)
Right of Way width	7 feet
Line Length	33 miles
Land Temporarily Disturbed	
Trenching width	7 feet
Wire Splicing sites	42' x 15'
Special installations	
Whitewater River burial	6" conduit at 3' depth
Circuit configuration	as many as 3 circuits per trench, non-specified configuration
Land permanently required	
Hand Holes (at each machine)	5' x 5'
Right-of-Way for Trenches	19 miles

Above Ground Transmission

Line Length	5800 feet
Type of Structure	tubular steel pole
Structure Height	30' to 100'
Structure Base	600' to 800'
Span Length	700 ' average
Number of Structures	8
Right-of-Way Width	50'
Land Temporarily Disturbed	
Tower Base	10' x 10 '
Wire Pulling Site	100' x 200'
Wire Splicing Site	at pulling site
Construction Yard	part of the laydown area
Land Permanently Required	40 square feet
Voltage	34,500 watts (34.5 kV)
Capacity	30 MW
Circuit Configuration	two circuits per structure, single conductor per phase, vertical configuration
Conductor Type	ACSR (Cardinal, non-specular finish)
Minimum Ground Clearance of Conductor	30'

TABLE F-2

U.S. Windpower Project

Transmission Line Designs

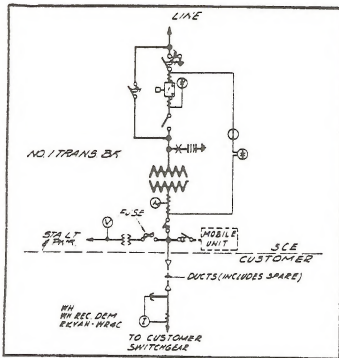
	<u>33 kV Line</u>	<u>13 kV Line</u>
Line Length	2-10 miles	1-6 miles
Type of Structure	Single woodpoles	single wood-poles (above)
Structure Height	45 - 55 ft	40 - 50 ft
Structure Base	.75 ' radius	.52 ' radius
Span Length	200 - 360 ft	200 - 250 ft
Number of Structures	25 - 123	23 - 138
Right of Way Width	40 ft	within 50 ft width of tower strips
Land Temporarily Disturbed:		
Tower Base	20' x 60'	3' x 3'
Wire-Pulling Sites	42' x 15'	20' x 12'
Wire Splicing Sites	42' x 15'	0
Land Permanently Required	43 - 217 sq ft	20 - 117 sq ft
Voltage	33,000 (33 kV)	13,000 (13 kV)
Capacity	60 MW	20 MW
Circuit Configuration:	Single Circuit Structure 1 Conduc- tor per phase, delta configuration	Same
Current Limit		
Minimum Ground Clearance of Conductor	22'	22'

TABLE F-3
SCE Project
Transmission Line Design

	Boeing	Bear Sterns /Bendix	WECS Tech	Westinghouse	Ventus
Line Length	0.75	1.6	1.3	1.0	2.3
Type of Structure	Wood pole	Wood pole	Wood pole	Wood pole	Wood pole
Structure Height	45 ft.	45 ft	45 ft	45 ft	45 ft
Structure Base	-----12" - 18" hole direct buried 5' - 6' deep-----				
Span Length	300 ft	300 ft	300 ft	300 ft	300 ft
Structures per Mile	17	17	17	17	17
Row Width	10 ft	10 ft	10 ft	10 ft	10 ft
Land Temporarily Disturbed					
Pole Base	-----truck access-----				
Wire Pulling Site	-----20' x 30' at ends of line-----				
Wire Splicing Site	-----No land impact-----				
Construction Yard	N/R	N/R	N/R	N/R	N/R
Land Permanently Required (Ac)	0.91	1.94	1.58	1.21	2.79
Voltage	33	33	33	3	33
Capacity (min)	12.5	22.5	5.5	30	30
Circuit Configuration	-----Refer to Exhibit C-----				
Conductor Size	To be determine during final design				
Electric Field of Edge Row	Nil	Nil	Nil	Nil	Nil
Magnetic Field of Edge Row	Nil	Nil	Nil	Nil	Nil
Electrostatic Short Circuit Current Limits	To be determined during final design				
Minimum Ground Clearance of Conductor (min)	30 ft	30 ft	30 ft	30 ft	30 ft

FIGURE F-1

Substation Details

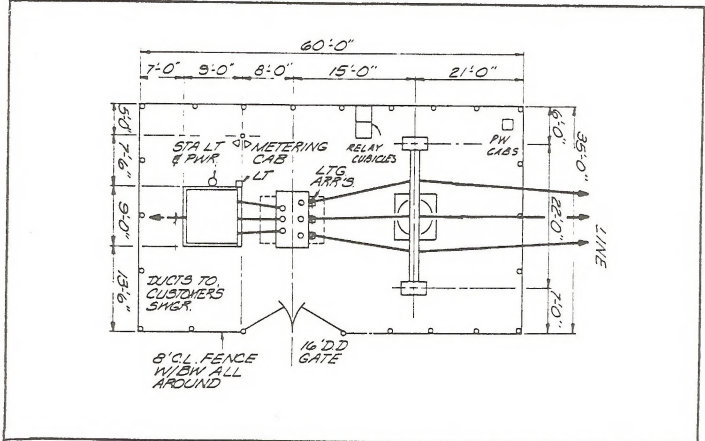


ONE LINE

STATION TYPE D

This station is designed to use steel structures throughout with minimum space requirements. The station is capable of serving loads up to 22.4 MVA. The station is limited to the initial installation of one line and one transformer bank. The design assumes a breaker is required to provide adequate protection. A switch is installed to bypass the breaker during maintenance periods. An underground service to the customer is planned.

PLOT PLAN



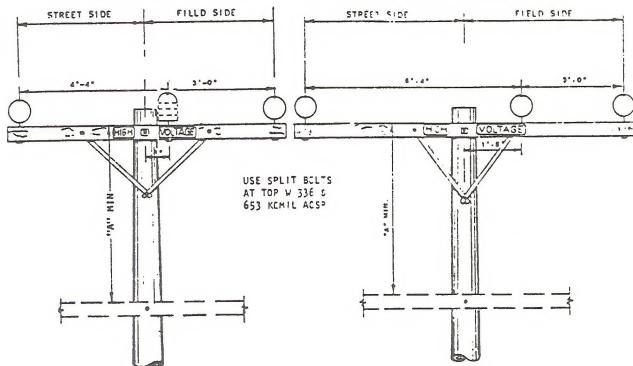
Source: Southern California Edison

FIGURE F-2

SCE Transmission Line Configurations

MAXIMUM SPAN 660 FT.

MAXIMUM SPAN 660 FT.



MAXIMUM SPAN 660 FT.

THIS CONSTRUCTION IS FOR USE WHERE 0.7500 VOLT CIRCUITS ARE UNLIKELY.

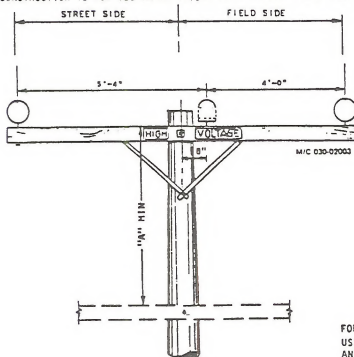


TABLE FOR DIMENSION "A"

TOP CIRCUIT KV.	LOWER CIRCUIT - KV.		
	0.7.5	12.0# 16	33
33	6'-0"	6'-0"	6'-0"
12.0# 16	5'-0"	5'-0"	

FOR ALLOWABLE APPARATUS SEE G.O. 95 PULE 54.4-DOB
USE V BRACES FOR WIRE SIZES LARGER THAN #2 COPPER
AND 1/0 ACSR

Rev. 6-22-78 FORMERLY PAGE DC 500.1

12/16/33 KV HORIZONTAL CONFIGURATION
3-WIRE STRAIGHT LINE - TYPICAL



Southern California Edison Company - DISTRIBUTION CONSTRUCTION STANDARDS

DC 500

OH

TABLE F-4
PanAero Project
Transmission Line Designs

Line Length	19.8 miles for all facilities
Type of Structure	Wood
Structure Height	50 ft. minimum
Structure Base	Approximately 24" diameter
Span Length	400 ft average
Structure per Mile	13
Right of Way Width	30 ft
Land Temporarily Disturbed	
Structure Base	10 ft. x 20 ft.
Wire Pulling Site	20 ft. x 50 ft.
Wire Splicing Site	20 ft. x 50 ft.
Construction Yard	100 ft. x 200 ft.
Land Permanently Required	1,030 sq. ft.
Voltage	33,000 (33 kV)
Capacity	30 MW/60 MW double circuit
Circuit Configuration	Vertical configuration. Two circuits per structure. Single conductor per phase
Conductor Size	477 MCM - 795 MCM
Conductor Type	ACSR, non specular finish
Electric Field at edge of ROW	Less than 1.5 kV/M
Magnetic Field Density at edge of ROW	Less than 6.0×10^{-5} TESLA
Electrostatic Short-Circuit Limits	Less than 5 ma
Minimum Ground Clearance of Conductor	Per N.E.S.C. but not less than 25 ft.

FIGURE F-3

Pan Aero Typical Wood Pole Structure

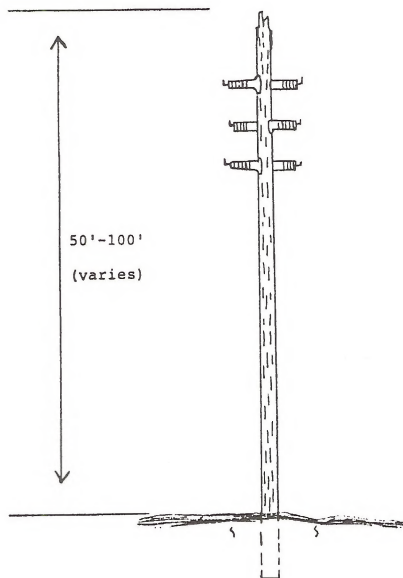


TABLE F-5
City of Riverside
Electrical Construction Specifications

UNDERGROUND COLLECTION

Voltage	4,160
Direct burial	48" minimum cover
Total length (8 machines)	14,000 feet
Conductor Size	350 MCM all aluminum
Land temporarily disturbed by trenching	18" width -- total length 14,000 feet

OVERHEAD POLE LINE

Description	Double circuit, single pole
Type of pole	Wood - 50 ft.
Span length	300 ft. average
Line length	5,000 ft.
Minimum conductor ground clearance	30 ft.
Conductor size	336 MCM, ACSR
Right-of-Way width	15 ft.
Circuit capacity	6 MW single 12 MW double

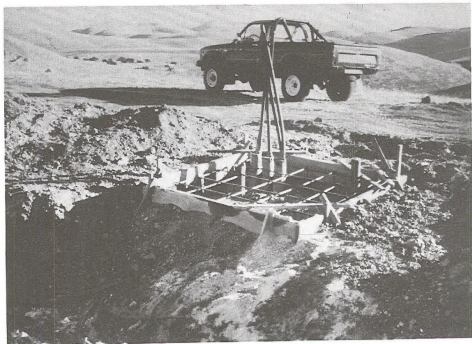
APPENDIX G

INSTALLATION OF U.S. WINDPOWER 56-50 AT LIVERMORE, CALIFORNIA



Figure G-1
Steel reinforcing cage is placed
in an eight to nine foot hole,
drilled by an auger for the friction
pier tower foundations. Three cubic
yards of earth must be removed.

Figure G-2
Tower leg foundation:
cement pouring complete, wires holding
bolts that attach to
tower extend above
foundation.



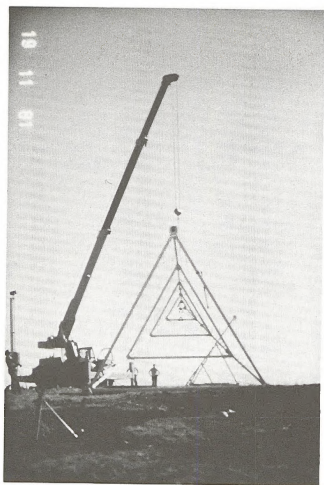


Figure G-3
Tower is assembled and hoisted into place by a crane.

Figure G-4
Tower has been raised; it
will be attached to the
foundation by anchor bolts.

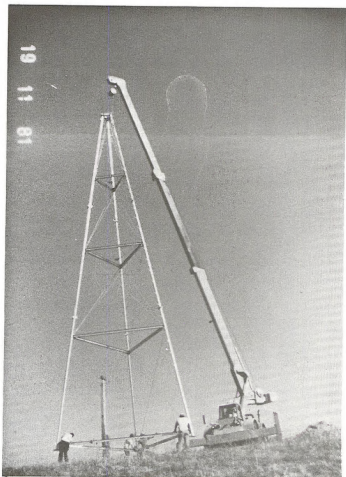
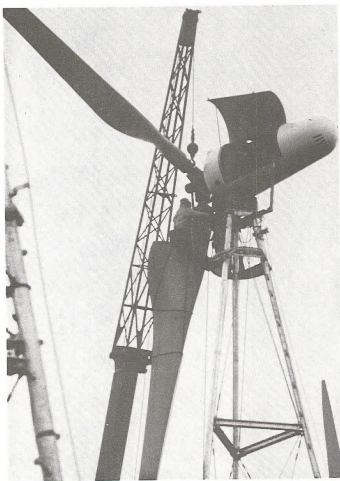




Figure G-5
Blades and turbines
arrive at site and are
removed from flatbed truck.

Figure G-6
Blades are attached to windmill
rotor.



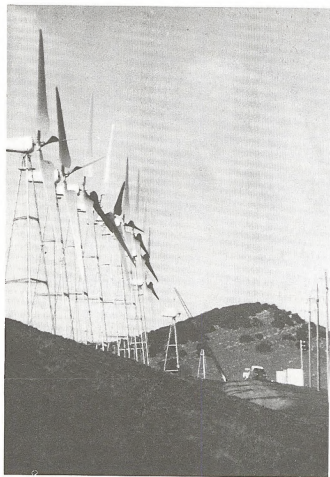
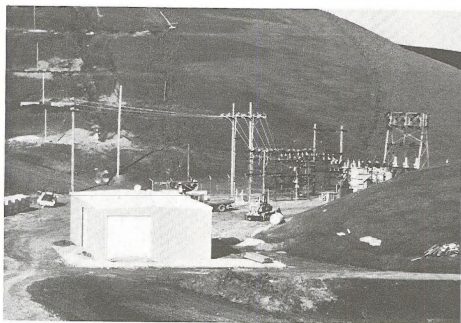


Figure G-7
 Nearly completed turbine row. Note
 access road, 12kV overhead transmission
 line, and nacelle being hoisted into
 place in the rear.

Figure G-8
 Completed substation
 and control room.



APPENDIX H

VISUAL RESOURCE EVALUATION METHODOLOGY

To evaluate the scenic resource, BLM has developed the Visual Resource Management (VRM) system (BLM Manual 8400). Classification involves evaluation of scenic quality, visual sensitivity, and distance zones. These three factors determine the visual resource management class for an area. There are five visual management classes an area may fall into, and for each class there is a different management objective defined in terms of visual tolerance to surface disturbance.

The study area has been divided into three management classes based on the Sundesert EIS (BLM and NRC, 1978) and California Desert Plan (BLM, 1980). The largest of these areas is the upper and lower Coachella Valley which corresponds to VRM class III. The Indio Hills area corresponds to VRM class IV and the Pass corresponds to VRM class II. Although the Sundesert EIS rated the Whitewater WSA as class I, current policy is to manage WSAs as class II until a determination is made on their suitability (see Map 3-2). The Management objectives of each of the three classes are described below:

CLASS II: Changes in any of the basic elements (form, line, color, texture) created by an activity should not be evident in the characteristic landscape. Contrasts are seen but must not attract attention. The spatial dominance should not exceed a subordinate level; or the impact(s) should have negligible effect on the overall visual resource quality.

CLASS III: Changes in any of the basic elements created by an activity may be evident in the characteristic landscape. The spatial dominance should not exceed a co-dominant level; or the impact(s) could have some noticeable effect on the overall visual resource quality.

CLASS IV: Contrasts may attract attention and be a dominant feature of the landscape in terms of scale dominance;^{1/} or the impacts could have some negative effect on the overall visual resource quality.

VRM classes are generally derived from scenic quality ratings, sensitivity to change and distance zones, and set at a minimum acceptable level of visual contrast. However, the Bureau's system is designed for use primarily in more natural landscapes, while significant portions of this study area are developed or "urbanized." In this type of situation, it

^{1/} Dominant - the modification is the major object or area in a setting and occupies the primary attention in the setting.
Co-dominant - the modification is a major object in the area in a confined setting or a major object area in an unconfined setting.
Subordinate - the modification is a significant size area but occupies a minor part of the setting.
Insignificant - the modification is a small object, occupying a very small area in th setting.

is possible that negative impacts can be reduced so that the overall existing visual resource quality is not effected or impaired yet still have contrast/dominance levels that do not precisely meet the Bureau's VRM objectives. Therefore additional factors need to be considered in the evaluation process, including visual dominance^{2/} and effects on the overall visual resource quality.

To accomplish this, an overall modification rating has been compared to the existing visual setting for each proposal. Modifications would be composed of three major project elements:

1. Roads including underground electric transmission systems.
2. Wind turbines including site work, and other infrastructure where appropriate.
3. Overhead electric transmission systems including site work.

If the scale dominance and contrast is equal to or less than the comparable acceptable contrast level identified for each visual management class (strong, moderate, weak, negligible) either before or after mitigation, the project could still meet the overall visual resource objectives for the area. However if the scale dominance and contrast is greater than the comparable acceptable contrast level and the project would not meet the overall visual resource quality objectives for the area then it would not be acceptable. The following is a summary of the comparable contrast/dominance and visual resource quality levels for each modified VRM objective.

STANDARD(S)

<u>Visual Resource Management Classes & Development Objectives</u>	<u>Visual Contrast/ Dominance Level</u>	<u>Visual Resource Quality Level</u>
Class II - Not Evident	Weak/Subordinate	Negligible
Class III - Evident	Moderate/Co-dominate	Noticeable effect
Class IV - Conspicuous	Strong/Dominant	Negative effect

Visual Simulations

In order to effectively analyze the visual impacts of wind turbine development, visual simulations of each development proposal were prepared. Two types of simulations were utilized for analysis: (1) computer graphics and (2) full color photographs both before and after development. A total of 18 computer graphic simulations were analyzed and 13 representative color simulations were selected. These represent typical views of the area, proposed development, and typical mitigations (see Figures 4-1 through 4-15, 4-20 and 4-21). Map 3-2 indicates the location of each view analyzed with computer graphic techniques and the final views selected for full color simulations.

^{2/} For a more detailed description of dominance refer to the (Draft) Landscape Planning Methodology Research for Range, Timber, and Energy Producing Wildlands, Visual contrast Rating Research. Richard Smardon 1980

Although computer graphics are a helpful tool, there are a number of limitations to their use as an analytical tool relating to orientation of turbines, infrastructure, landscape detail, line density and topographic data. Therefore, the computer simulations were used specifically to locate the wind turbines for the color simulation and not as representing the real appearance of wind turbine development. The 13 color simulations provide a more accurate representation of the effects on the visual resource. Please note that there may be tonal shifts in color due to the variables in the original photography and reproduction of prints.

APPENDIX I

Known and Potential Occurrence of Rare, Threatened and Endangered
Plant Species in the Lease Application Areas

APPLICANTS	PLANT SPECIES			
	<u>Linanthus maculatus</u>	<u>Astragalus lentiginosus</u> var. <u>coacheliae</u>	<u>Euphorbia platysperma</u>	<u>Monardella robinsonii</u>
Windfarms	Present or nearby Sec. 12, T. 3S, R. 3E. Could be present to the north also.	Present in Sec. 24, T. 3S, R. 3E; potential habitat in Secs. 20, 22 and 28, T. 3S, R. 4E.	Potential habitat in Sec. 24, T. 3S, R. 3E and Secs. 20, 22, and 28, T. 3S, R. 4E.	No records near or within lease area.
U.S. Windpower	On or nearby Sec. 12, T. 3S, R. 3E.	Present in Section 24, T. 3S, R. 3E; potential habitat in Secs. 20, 22, and 28, T. 3S, R. 4E.	Potential habitat same as for <u>A. lentiginosus</u> var. <u>coacheliae</u> .	No records near or within lease area.
PanAero	Nearby, within 0.25 mile Sec. 28, T. 3S R. 5E; potential habitat in Sec. 34, T. 3S, R. 5E.	Present in Sec. 24, T. 3S, R. 3E; within 0.25 to 0.4 mile in Sect. 32, T. 3S, R. 5E; potential habitat in Secs. 20, 22, and 28, T. 3S, R. 4E.	Potential habitat in Secs. 20, 22, and 28, T. 3S, R. 4E; also Secs. 18 and 24, T. 3S, R. 3E; also Secs. 28, 32, and 34, T. 3S, R. 5E.	No records near or within lease area.
Southern California Edison				
<u>Boeing</u>	No records near or within lease area.	No records near or within lease area.	No records near or within lease area.	No records near or within lease area.
<u>Bear Sterns/Bendix</u>	No records in lease area; potential habitat in Sec. 2, T. 2S, R. 3E.	No records near or within lease area.	No records near or within lease area.	No records near or within lease area.

APPENDIX I

Known and Potential Occurrence of Rare, Threatened and Endangered
Plant Species in the Lease Application Areas

APPLICANTS	PLANT SPECIES			
	<u>Linanthus maculatus</u>	<u>Astragalus lentiginosus</u> var. <u>cochellae</u>	<u>Euphorbia platysperma</u>	<u>Monardella robisonii</u>
<u>WECS Tech</u>	Present or within 0.25 mile; Sec. 12, T. 3S, R. 3E.	No records near or within lease area.	No records near or within lease area.	No records near or within lease area.
<u>U.S. Windpower</u>	Potential habitat in Sec. 34, T. 2S, R. 3E.	No records near or within lease area.	No records near or within lease area.	No records near or within lease area.
<u>Westinghouse</u>	No records near or within lease area.	Potential habitat in Sec. 22, T. 3S, R. 4E.	Potential habitat in Sec. 22, T. 3S, R. 4E.	No records near or within lease area.
<u>Ventus</u>	No records near or within lease area.	Potential habitat in Secs. 20 and 28, T. 3S, R. 4E.	Potential habitat in Secs. 20 and 28, T. 3S, R. 4E.	No records near or within lease area.
San Geronio	Present or within 0.25 mile in Sec. 12, T. 3S, R. 3E.	No records near or within lease area.	No records near or within lease area.	No records near or within lease area.
City of Riverside	Potential habitat in Sec. 34, T. 2S, R. 3E.	No records near or within lease area.	No records near or within lease area.	No records near or within lease area.
Smart	No records near or within lease area	Present in Sec. 24, T. 3S, R. 3E.	Potential habitat in Sec. 24, T. 3S, R. 3E.	No records near or within lease area.

APPENDIX J

Standard Operating Procedures

Compliance with the following standard operating procedures and generic mitigation will apply to implementation of any alternative or combination thereof. Mitigating measures, which are designed to avoid or minimize impacts specific to an alternative, are described in Chapter 4.

STANDARD OPERATING PROCEDURES

1. Uses of public lands not yet specifically addressed in this environmental impact statement (EIS) will be subject to further environmental assessment and possible modification by the Authorized Officer (AO).

Effectiveness. This intensive and specific evaluation would enable the Authorized Officer (AO) to reduce or mitigate most of the adverse environmental impacts associated with any proposed development.

2. The grantee will do everything reasonable, both independently and/or upon request of the AO, to prevent and suppress fires caused by the grantee, his contractors or sub-contractors on or near the lands occupied. The applicant will comply with any fire plan submitted by the land management agency with jurisdiction over lands crossed by the project.

During construction in areas where fire hazards exist, all vehicles and gas-powered equipment will be equipped with spark arrestors. A fire patrolman with a pumper-equipped pickup truck will be on site where necessary. If required, fire-fighting equipment will be located in cache boxes along the right-of-way at strategic locations. All welding, grinding operations and smoking privileges will be controlled in fire danger areas. When weather conditions create an extreme fire danger, construction operations will be limited or suspended in specific areas as required by the applicable authorizing agency. The grantee will establish a project fire plan and all project personnel will be instructed as to individual responsibility in implementation of the plan. Federal, private, and State interests will be compensated by the grantee for suppression and rehabilitation expenses as per existing statutes.

Effectiveness. The possibility of fires would not be eliminated. Identifying liability for such fires may tend to make the grantee more cautious. Various interests would be protected against loss due to fire.

3. The grantee shall comply with applicable Federal, State, and local laws and all regulations issued thereunder affecting in any manner construction, operations, maintenance, or termination of the system.

Effectiveness. Commitment to this stipulation would enhance protection afforded by such laws and regulations.

4. The grantee shall take all measures to protect the health and safety of all persons affected by its activities performed in connection with the construction, operation, maintenance, and termination of the system, and shall immediately abate any health or safety hazards.

The following measures will help ensure compliance with Occupational Safety and Health Administration (OSHA) and provide for public and worker safety:

- a. Comply with speed limits established by BLM on all roads for purposes of dust control and public safety;
- b. Perform dust-control measures on all roads, staging areas, borrow areas, heliports, etc., when loss of visibility due to dust causes a safety hazard.
- c. Provide appropriate signing of roads and helicopter staging areas to provide for public safety, where considered necessary by BLM;
- d. Sign roads and helicopter staging areas appropriately for public safety purposes, such as "Caution Heavy Truck Traffic" or "Be Prepared to Stop," where such signs are considered necessary by the liaison officer;
- e. Place signs on substations to warn the public of high voltage;
- f. Provide flagmen, barricades, and other safety measures to ensure public safety, as directed by the authorized BLM officer;
- g. All work with explosives will be performed in such a manner as to create no endangerment to life or property; all storage places for explosives and flammable material will be marked "dangerous," the method of storing and handling explosives and flammable materials will conform to all relevant Federal, state, and local laws and regulations; fuses will not be used in blasting.
- h. Blasting will be used only when necessary. Where blasting is necessary, the following safety precautions will be taken:
 - (1) in areas of human use, blasting will be blanketed;
 - (2) landowners in close proximity to the blasting will be notified in advance so that livestock and other property can be adequately protected;
 - (3) before blasting a clearance will be necessary to ensure that construction personnel and local residences were out of danger; and
 - (4) blasting will be controlled or limited where damage to rock mass may create slope instability.

Effectiveness. Adherence to this stipulation would promote a safe work environment for employees and the general public.

5. The grantee will provide botanists, archaeologists, wildlife biologists, and other specialists as appropriate (subject to approval of the AO), for all necessary surveys in areas to be disturbed by the project.

These individuals must have the necessary valid permits or licenses. Separate permits shall be required for survey and mitigation excavation.

Effectiveness. This measure would provide consideration for sensitive values in the fields of professions identified. This would provide a high degree of protection for surface resources; somewhat less for subsurface resources.

6. The grantee will observe the following sanitation measures to help prevent contamination of ground or surface waters and soils:

- a. Remove or dispose of all participant-generated waste in a manner satisfactory to the liaison office. The term "waste" as used here means all discarded matter, including but not limited to human waste, trash, garbage, refuse, oil drums, petroleum products, ashes, and equipment. Construction sites will be maintained in a sanitary condition at all times, and garbage and refuse at those sites will be disposed of promptly.
- b. Discharge sanitary waste only in approved sewage-treatment plants and solid waste in approved sanitary landfills.
- c. Follow a litter-policing schedule on all roads associated with the project.
- d. Prevent the release or disposal of used oil and other petroleum products on any lands or bodies of water.

Effectiveness. Visual quality and safety would be enhanced.

7. Final road and WTG construction engineering specifications (including WTG-site surveys, substations and transmission line systems designs and locations, locations of borrow sites, stockpiling, and storage areas, specific drainage devices proposed, work schedule, needed equipment, rehabilitation measures, waste disposal methods, proof of state and local permits will be supplied in writing to BLM for study and approval 60 days prior to proposed construction. Any changes in schedule will be submitted to BLM at least 30 days in advance of construction.

Effectiveness. Such submission would provide sufficient time for necessary planning.

8. The grantee will be required to coordinate with the affected Federal, State, and local transportation authorities regarding road development.

Effectiveness. Conflicts with affected parties would be minimized.

9. Liquid and solid wastes must be disposed of according to provisions of the Resource Conservation and Recovery Act of 1976 (and amendments).

Effectiveness. Provisions are designed to protect elements of local ecosystems and human health and safety to the best means practical.

10. Water bars will be constructed on permanent direct or gravel access roads to adequately divert runoff to natural drainages. The location of water bars will be determined by the AO. Roadside drainage ditches will be constructed on access roads to reduce water flow and velocity. Drainage ditches will be dug at intervals determined by the AO. Roads will be "out-sloped" as much as possible. Berms will be removed.

Effectiveness. This measure would be helpful in preventing or controlling erosion. The degree of effectiveness cannot be determined at this time.

11. Scalping of topsoil will not be allowed except as approved by the AO. When scalping is allowed, suitable topsoil and subsoil will be scraped and stockpiled for reclamation use.

Effectiveness. The stockpiling and respreading of topsoil would make it possible to establish a suitable seedbed.

12. Access roads will be properly built in flood prone and flash flood areas to avoid erosion and gullying.

Effectiveness. The degree of effectiveness cannot be determined at this time. However, significant erosion problems may be avoided.

13. To minimize the potential of collisions and electrocution of raptors, the design of transmission lines and towers will conform to the guidelines for raptor protection described in the Raptor Research Report No. 4, Raptor Research Foundation, Inc. 1981. These guidelines provide design and modification of poles, cross arms, wire placements to effect adequate separation of energized hardware; insulation of wires and other hardware where sufficient separation cannot be attained; and management of eagle perching. In addition, all transmission line facilities should avoid crossing ridge tops to avoid bird and tower line collisions.

Effectiveness. This measure will minimize impacts on raptors in areas of construction.

14. The grantee shall report any raptor electrocutions, discovered or reported on or near project facilities to the AO.

Effectiveness. Reporting of wildlife kills would aid in determining problem areas. Once the problem would be determined, corrective action could be taken; however, effectiveness would be highly variable.

15. The grantee shall not use water from springs, wells, seeps, creeks, or streams which have been appropriated to Federal agencies or other users without the written authorization from the AO or water rights owner.

Effectiveness. The potential for conflicts arising over unauthorized use of water would be greatly reduced.

16. Any water used with the approval of the AO or water rights owner shall be only for the specific purpose and duration described in the written authorization of the AO or water rights owner.

Effectiveness. The potential for conflicts arising over unauthorized use of water would be greatly reduced.

17. Upon revocation or termination of this grant, or termination of use of any part of the energy system located on public lands, the grantee shall remove all improvements and equipment, except as otherwise approved in writing by the AO, and shall restore the land to a satisfactory condition as determined by the AO.

Effectiveness. Abandoned improvements and equipment would be prevented from becoming an eyesore and/or safety hazard.

18. The grantee shall avoid areas subject to mudflows, landslides, mudslides, avalanches, rock falls, and other types of mass movements when locating wind turbine generators and powerlines.

Effectiveness. Avoidance of or designing for such conditions would be effective in lessening associated dangers. Avoidance would be highly effective.

19. No dumping of oil waste, toxic materials, solid or liquid wastes will be allowed except in authorized waste disposal sites. No burying of debris or waste materials will be allowed except as specifically authorized by the AO.

Effectiveness. This would protect against contamination of ground water and surface water and would prevent air pollution from these sources.

20. Specific sites (e.g., archaeological sites, areas with threatened and endangered species, fragile watershed, etc.), where construction equipment and vehicles will not be allowed will be clearly marked on the site by the AO before any equipment is brought in. The grantee will be responsible to assure that construction personnel are well versed in recognizing these markers and that they understand the restrictions of equipment movement that are involved.

Effectiveness. This measure would enhance protection of identified sites.

21. Travel will be restricted to rights-of-way and existing public roads. Cross-country motor vehicle travel will be prohibited.

Effectiveness. This measure would reduce impacts on soil and vegetation outside access roads and immediate construction areas.

22. The grantee or permittee shall confine all activities within the area specifically defined in the right-of-way or permit.

Effectiveness. This measure would reduce impacts on soil and vegetation outside access road and immediate construction areas.

23. The grantee or permittee shall make application in accordance with applicable regulations for all proposed access roads not granted in the primary right-of-way or permit and located on public lands outside the permit or grant area.

Effectiveness. This measure would greatly reduce unnecessary soil and vegetation disturbance and would help hold allowed disturbance to a minimum.

24. After construction activities are completed, the grantee or permittee shall not prohibit the public in general from using the grant or permit area for all lawful purposes which are not inconsistent with the use for which the grant or permit was issued.

Effectiveness. The rights of the general public to use publically owned land would be protected.

25. The grantee or permittee will be allowed to regulate access and vehicle traffic as required to insure security and public safety during construction operations.

Effectiveness. Allowing the grantee to regulate access and vehicle traffic would be effective in providing for public safety and security during construction operations.

26. The grantee or permittee shall be responsible for providing and installing regulatory signs that are necessary for users of access roads. The location and type of sign shall be approved by the AO.

Effectiveness. The safety of the users of public roads would be enhanced.

27. The grantee or permittee shall permit free and unrestricted access over public lands for all lawful and proper purposes, except in areas designated as restricted by the grantee or permittee with the consent of the AO, in order to protect public safety, health, and facilities constructed on the right-of-way.

Effectiveness. The rights of the general public to use publicly owned lands, consistent with safety requirements, would be protected.

28. The grantee acknowledges and agrees that the issuance of this permit or grant is subject to the express condition that the exercise thereof will not unduly interfere with the management, administration or disposal by the United States of lands affected thereby or the full and safe utilization thereof by the United States, for necessary operations incident to such management, administration, or disposal for purposes which are not inconsistent with or will not defeat the objective of the grant.

Effectiveness. Commitment to this stipulation will protect the prerogative of the United States to manage public lands of the United States.

29. The grantee agrees and consents to the occupancy and use by the United States, its grantees, permittees, or lessees of any part of the permit or grant area not actually occupied or required by the project for purposes which are not in conflict with the grantees' or permittees' activities and use.

Effectiveness. Commitment to this stipulation will protect the prerogative of the United State to manage public lands of the United States.

30. The grantee agrees that all operation under this grant or permit shall comply with State and Federal laws concerning the use of poisonous or hazardous substances, including insecticides, herbicides, fungicides, rodenticides, and other similar substances. Prior to the use of such substances on or near the permit or grant area, the grantee shall obtain from the AO approval of a written plan for such use. The plan shall state the method of application and other information as the AO may require. All use of such substances on or near the grant or permit area shall be in accordance with the approved plan. If the use of a poison is prohibited by the Secretary of the Interior, it shall not be used. If use of a poison is limited by the Secretary of the Interior, it shall only be used in accordance with that limitation.

Effectiveness. Commitment to this stipulation will insure compliance with Federal and State laws in the use of poisonous or hazardous substances. It would not insure that environmental damage would be avoided where the use of such substances were allowed.

31. The grantee will avoid disturbance or removal of cadastral survey monuments and markers. Where construction operations require such removal and relocation, this will be accomplished by BLM or in accordance with detailed instructions prescribed by the O. All costs for such operations will be borne by the grantee or permittee.

Effectiveness. This measure will greatly reduce the possibility of located survey monuments and markers being disturbed. There would remain a chance that unidentified monuments could be destroyed.

32. Cut and fill slopes will be shaped to existing land contours. All natural drainages will be preserved.

Effectiveness. Shaping of cut and/or spoil slopes would be effective in blending these areas with the land form. However, visual impacts would remain due to vegetational differences.

33. All clearing of construction areas will be free form and will respond to the existing forms and shapes in the area (i.e., use of curvilinear shapes rather than rectilinear). Temporary sites will be kept as small as possible and will be located in areas of minimum vegetation and slope.

Effectiveness. This type of clearing would be effective in reducing visual impacts. However, degree would be site specific.

34. All exposed facilities will be painted with colors selected for compatibility with the surrounding environment except where human safety consideration would dictate otherwise.

Effectiveness. Visual impact of facilities would be lessened, though degree of effectiveness cannot be determined at this time.

35. All conductors will be of nonspecular material unless otherwise approved by BLM/National Regulatory Commission.

Effectiveness. This measure would decrease visibility of wires and poles and would help to make them blend with the background.

36. No paint or permanent discoloring agents will be applied to rocks or vegetation for indicating survey or construction activity limits, points, etc.

Effectiveness. This measure would eliminate impacts which would occur from such activity.

37. Where vegetation needs to be cleared for construction but not for actual operations it will be clipped at ground level to allow resprouting.

Effectiveness. Reduce the length of time required for site recovery.

38. Where recommended and approved by the Bureau, vegetation removed during construction will be shredded and disposed of at an approved dump site or stockpiled to be used as mulch for erosion protection.

Effectiveness. Adherence would decrease the risk of fire and improve site rehabilitation.

39. Excess soil material created during pad construction will be used as fill for roads or removed to a suitable dump site. Under no condition will this material be disposed of at locations which could interfere with natural drainage channels.

Effectiveness. Limit area of disturbance to permanent facilities.

40. Metal surfaces of substations will be dull. If paint or concrete is used it will be of a dull surface and of colors complimentary to the surrounding landscape.

Effectiveness. Reduce contrast to blend with surrounding landscape.

41. A preconstruction survey of the surveyed transmission line and access road centerlines and the tentative WTG sites will be conducted by the applicant, subject to BLM approval, to determine how to avoid or mitigate specific areas susceptible to increased wind and water erosion. These will include areas such as desert pavement and erodible soil on steep slopes, designated floodways, floodprone areas, and source, transport and deposition areas for blow sand.

Effectiveness. This measure would limit the amount of wind and water erosion.

42. Avoidance of identified cultural resources is the preferred archaeological mitigation. Where technically feasible, tower sites, access roads, storage sites, and substation sites will be shifted away from all identified cultural resources.

- a. After completion of the engineering survey, a qualified archaeologist provided by the grantee will complete an intensive archaeological inventory (BLM Class III) and of all areas to be disturbed using the following guidelines:

(1) Institutions and individuals conducting the inventory work will be qualified to complete a professional archaeological inventory and must be acceptable to BLM. Such work must be completed under an Antiquities Permit.

(2) The results of the archaeological and historical field inventory will be submitted to the BLM three months prior to construction. The report will detail findings of the inventory and make recommendations for further resource protection, either via avoidance or data retrieval studies. All cultural resource sites that cannot be avoided will be mitigated according to a detailed plan submitted to BLM. Such mitigation will not begin until BLM approval of the mitigation plan is obtained.

(3) All sites will be evaluated for possible inclusion on National Register of Historic Places and the applicant (with BLM concurrence) will complete the necessary documentation for nomination and submission to the State Historical Preservation Officer (SHPO).

(4) All sites/districts that qualify for the National Register of Historic Places should be avoided by construction activity. If avoidance is not feasible, the applicant will indicate this to BLM. Such notification will be made prior to construction and will include proposed mitigation measures. In such cases, a statement of effect in compliance with the Natural Historic Preservation Act, Section 106, will be completed prior to the commencement of surface disturbance.

- b. The applicant's project archaeologist will flag the perimeters of those archaeological sites that are to be avoided. Flagging will be done just prior to the construction period and removed as soon as construction activity has moved one.
- c. The applicant will determine, through the project archaeologist and in consultation with the BLM and SHPO, what protection measures will be afforded individual archaeological sites during construction.

Effectiveness. The BLM would apply consistent management practices on public lands for all archaeological and historic resources, conveying information to the SHPO or other agencies as appropriate. Regulatory conformance would be enhanced.

These measures will be highly effective in preventing damage to cultural resources and in preventing damage to subsurface resources beyond that caused during discovery in those areas surveyed. All sites, will be given proper consideration for inclusion on the National Register of Historic Places.

43. The grantee will immediately bring to the attention of BLM all antiquities or other valuables of cultural or scientific interest, including (but not limited to) historic and prehistoric sites, fossils, and artifacts discovered as a result of construction operations under this permit,

and will leave such discoveries intact until clearance to proceed is granted by a project archaeologist. BLM will evaluate any discoveries and determine within ten working days what action will be undertaken prior to proceeding with any operations that might be destructive to such discoveries.

Effectiveness. Improve current understanding of site locations, contents and sensitivity. Re-routing roads and structures to avoid identified sites would be effective in limiting damage to cultural resources.

44. Recommendations to mitigate adverse impacts to Native American Values will be developed through consultation and coordination with affected Native American communities prior to project development. Where site specific concerns exist, it may be possible to mitigate potential effects through project design overflow siting of facilities. It is anticipated that some categories of potential impact, e.g., impacts to "sacred sites" may not be accessible to mitigation. The nature and extent of such impacts will be dependent upon the final location of the WIGs.

45. The grantee will temporarily mark the exterior limits of the rights-of-way during construction in a manner that will not result in additional environmental damage. All activities directly or indirectly associated with the construction or maintenance of rights-of-way must be conducted within these limits unless prior notice has been given to BLM or the appropriate land-holding agency or individual and permission has been granted to extend activity beyond the limits of the right-of-way given by that agency or individual. Each case must be approved individually.

Effectiveness. Minimize site disturbance to approved rights-of-way.

46. For overhead transmission lines 34.5 kV and below, the right-of-way width will not exceed 30 feet for one free-standing double-circuit wood pole. Any variations from these specifications will require approval by BLM.

Effectiveness. Provide a necessary working space for transmission line construction while minimizing area disturbance.

CALL FOR APPLICATIONS

43086

Federal Register / Vol. 46, No. 165 / Wednesday, August 26, 1981 / Notices

DEPARTMENT OF THE INTERIOR

Bureau of Land Management

State of California; Call for Applications for Wind Energy Development in the San Geronio Pass

The San Geronio Pass area located in Southern California approximately eight (8) miles northwest of Palm Springs has been identified as one of the most promising wind energy development locations in California. In response to applications filed by private and public interests to develop the wind resource, the Bureau of Land Management (BLM) and the County of Riverside have entered into a joint Memorandum of Understanding to prepare an environmental document (EIR/EIS) assessing the impacts of development within the 200 square mile area.

The objectives of the Bureau are to:

- (1) Ensure timely and orderly development of this important resource in a manner compatible with the use of the public lands for other purposes;
- (2) Assure that wind exploration, development and production is conducted with maximum protection of the environment; and
- (3) Assure the public a fair return for the use of public lands and the use of its renewable resources.

To assist the Director of the BLM in carrying out these objectives and pursuant to Pub. L. 94-579, Title V of the Federal Land Policy and Management Act of 1976 (FLPMA), and 43 CFR Part 2800, requests for applications in addition to those already filed, are now being solicited from interested individuals for the next 60 days for possible granting of rights-of-way for power generating facilities on public lands.

Description of the Area

Applications will be considered within the area shown on the San Geronio Pass Wind Study Map available at the BLM California State Office, Sacramento, California. Public lands contained within the study area include: All or portions of Sections 15-36 inclusive, T.2S., R.3E. San Bernardino Meridian (SBM); Sections 2, 4, 10, 12, 14, 18, 20, 22, and 24, T.3S., R.3E., SBM; Sections 8, 10, 14, and 18, T.2S., R.4E., SBM; Sections 4, 18, 20, 22, 28, 30, 32, and 34, T.3S., R.4E., SBM; Section 34, T.2S., R.5E., SBM; Sections 2, 24, 26, 28, 30, 32, and 34, T.3S., R.5E., SBM; Sections 30 and 32, T.3S., R.6E., SBM; Section 6, T.4S., R.6E., SBM.

Right-of-Way Applications

Applications must be submitted not later than 60 days from the date of this notice. No other applications will be accepted after this date for inclusion in the EIR/EIS. In accordance with 43 CFR Part 2800, Rights-of-Way Principles and Procedures, applicants will furnish BLM a project description detailing what is being proposed and the time period involved; a legal description of lands you wish to apply for with a map showing their location; a non-refundable check to cover processing fees as explained in part 2803.1-1; and a copy of the company's charter or articles of incorporation certified by the State. The project description shall be in sufficient detail to enable the authorized officer to determine:

- (1) Its impact to the environment,
- (2) Any benefits provided to the public,
- (3) Safety of the proposal, and
- (4) The specific public lands proposed to be occupied.

The EIR/EIS will be funded by the Bureau through appropriated funds. To accomplish the above and to ensure that applications will be properly analyzed on both a site-specific and regional (cumulative) basis for the EIR/EIS, the project description accompanying the application must include all of the information provided below:

Project Description

1. Applicant
2. Contact—include phone number of project coordinator and engineer.
3. Manufacturer:
4. Location—include a legal description, acreage compilation, and map for all public lands under application. Also indicate Indian lands and private or State lands which you have or may be applying for and the status of these applications, i.e., have lease arrangements been completed?
5. Wind Machine Model—if more than one machine is under consideration for deployment include specifications for all types. Describe under what conditions one type of machine would be used over another.
6. Physical Specifications:
 - Total height.
 - Tower height.
 - Rotor diameter.
 - Total weight.
 - Weight of blades.
 - Foundation construction (width, depth and height).
 - Material specifications including weight of foundation.
 - Tower construction—materials and components.

Blade construction—materials and components.

Structure designs for the tower and foundation should be supplied.

7. Performance Specifications:

- Rotation speed (rotor RPM).
- Speed of blade tips.
- Power output.
- Cut-in speed.
- Noise generation.
- Cut-out speed.
- Rated wind speed.
- Rotor orientation.
- Generator RPM.
- Generator type.
- Gear box step-up ratio.
- Gear box type.
- 8. Projected Annual Production: Output based on annual average wind speed.

9. Additional Information:

- Rotor, hardware specification, i.e., type, size.
- 10. Brake System: Type.
- 11. Control Functions: Automatic yaw.
- Fail-safe brake application and release.

Alternator voltage and phasing. Circuit breakers for overcurrent control.

12. Variables Monitored—described your plans for monitoring the following items:

- Alternator output.
- Rotor speed.
- Wind speed.
- Wind direction.
- 13. Safety Features: Electrical systems designed to comply with National Electrical Code.
- Lightening protection on all circuits.
- Blade throw and probability of occurrence.

14. Wind Machine Construction Activities:

- Site preparation (both temporary and permanent).
- Temporary use areas. Construction yards for material storage and equipment maintenance stations.
- Provide security arrangements.
- Equipment pads or leveled areas at each tower site to facilitate equipment operation should be identified. A table similar to that shown below can be used to summarize land areas occupied.

Summary of Land Areas Temporarily and Permanently Occupied

Units	Acres temporarily occupied	Acres permanently occupied
WTG.		
Roads.		
New main roads.		
New spur roads.		
Existing roads.		
Work Areas.		
Construction yards.		
Other.		
Wind turbine installation. Describe installation procedures. Diagrams if available should be submitted.		
Construction equipment. Provide specifications of equipment (i.e., pickup, 4 x 4, crane 5-ton, etc. including fuel use requirements and length of service over construction schedule.		
Source and type of construction material.		
Clean up.		
Technical and construction personnel—describe workforce requirements for construction and maintenance activities.		
Show workforce schedule for construction period and source of labor supply (local or regional).		
Construction schedule.		
15. Operation and Maintenance:		
Patrols.		
Routine maintenance requirements.		
Equipment needs.		
Access roads.		
Other.		
16. Abandonment (plans for).		
17. Transmission System and Substation:		
Design		
Construction		
Operation and maintenance		
Abandonment		
18. Security of Facilities and Equipment:		
19. Construction Costs. Provide summary costs using table below:		

Construction Costs

WTG.	
Transmission Lines	
Substations, transformers, switches	
Roads	
Buildings and equipment	
Land and rights	
Remote control equipment	
Total	

Cost estimates for transmission lines and substations may be supplied by servicing utility.

20. Annual operation, maintenance, and replacement costs:

OM&R Costs

WTG.	
Transmission lines	
Substations, transformers, switches	
Roads	
Buildings	
Remote control equipment	
Total	

Costs for transmission lines and substations may be supplied by servicing utility.

This information must be received no later than 60 days from the date of this notice in order to facilitate prompt initiation of site-specific analysis in the environmental document.

The authorized officer shall acknowledge in writing receipt of the application. The authorized officer may require the applicant for a right-of-way grant to submit such additional information as he deems necessary for review of the application. All requests for additional information will be in writing.

Where the authorized officer determines that information supplied by the applicant is incomplete or does not conform to FLPMA or 43 CFR Part 2800 regulations the authorized officer shall notify the applicant of these deficiencies and afford the applicant an opportunity to file a correction. Where a deficiency notice has not been adequately complied with, the authorized officer may reject the application. All applications must be submitted to the State Director, Bureau of Land Management, California State Office, 2800 Cottage Way, E-2841, Sacramento, California 95825.

Environmental Analysis and Decision Process

Applications will be evaluated and used along with all applicable resource data pursuant to the National Environmental Policy Act of 1969 to determine what public lands may be available for wind development. The environmental analysis process, through the evaluation of alternatives and their effects (environmental, social and economic) will be used as a decision tool to sort out competing uses and potential uses of the public lands. This evaluation will be coordinated with Riverside County as a joint preparer of the EIR/EIS. In the event two or more applications for wind power facilities are received for the same site and the Bureau is unable to determine which proposal best serves the public need, a procedure such as competitive bidding may be utilized. In the latter case, notice of any tracts selected for competitive bidding will be published in the Federal Register stating the conditions and

terms for leasing in compliance with established Departmental procedures.

Questions regarding submittal of applications should be directed to either William Payne, EIS Project Coordinator (916) 484-4541 or Joan Russell, Lands Section Chief, (916) 484-4431.

Dated: August 17, 1981.

James B. Ruch,
State Director, California State Office, Bureau of Land Management.

[FR Doc. 81-34814 Filed 9-25-81; 8:45 am]
BILLING CODE 4310-04-M

[Exchange—I-16998]

Public Lands in Bear Lake County, Idaho; Realty Action

The following described lands have been determined to be suitable for disposal by exchange under Section 206 of the Federal Land Policy and Management Act of 1976, 43 U.S.C. 1716:

T. 14 S., R. 45 E., B.M., Idaho
Section 23: NE¼NE¼, 40 acres

In exchange for this land the Federal Government will acquire a 40-acre tract of non-Federal land in Bear Lake County from Kay and Joyce Rigby, described as follows:

T. 14 S., R. 45 E., B.M., Idaho
Section 13: SE¼SE¼, 40 acres

The purpose of the exchange is to:

1. Consolidate the public land in order to better manage it.
2. Allow authorized farming of the public land by transferring the subject parcel to a private party.
3. Provide long term benefits to the government, i.e., livestock forage, wildlife habitat.

This exchange is consistent with the Bureau's planning for the land involved and has been discussed with the Bear Lake County Commissioners. The public interest will be well served by making the exchange.

The value of the lands to be exchanged are approximately equal and money will be used to equalize the values upon completion of the final appraisal of the lands.

The terms and conditions applicable to the exchange are:

1. Both parties will reserve all minerals; only surface ownership will be exchanged.

2. Right-of-way granted to Idaho Power Company on the offered land and the Idaho Department of Highways on the selected lands will remain in effect.

Detailed information concerning the exchange, including the environmental analysis, is available for review at the Soda Springs Resource Area Office, 490

APPENDIX L
Microwave Transmitters

MICROWAVE TRANSMITTERS

SITE	LOCATION (Latitude/ Longitude)	USE	RECEIVER LOCATION	FREQUENCY (MHz)	AZIMUTH	EMISSION	FREQUENCY TOLERANCE	ANTENNA GAIN	ERP ¹	BEAM WIDTH	POLAR- ² IZATION	ANTENNA ³ HEIGHT
A	33°-42'-05" N 116-23-24 W	Power	O	2181.60	0.0	3000F9	0.0005	unk	56.9	5.5	H	590
B	33°-56'-07" N 116-38-22 W	Power	E	2134.80	154.0	800F9	0.0001	294	47.1	5.5	V	1550
C	33°-44'-28" N 116-09-53 W	Power	* * D *	1365.00 2180.00 2183.00 2197.00	173.0 285.0 323.0 98.0	3000F9 600F9 800F9 800F9	0.002 0.001 0.001 0.001	290 250 unk 294	63.0 55.06 63.1 56.1	5.8 10.0 5.5 5.5	H H V H	90
D	33°-55'-17" N 116-25-53 W	Power	A C E	2131.60 2138.00 2141.20	180.0 143.0 263.0	800F9 800F9 800F9	0.001 0.001 0.001	294 294 294	56.9 63.8 56.9	5.5 5.5 5.5	H V H	1038
E	33°-53'-57" N 116-37-20 W (Windy Point)	Power	B D	2184.80 2191.20	334.0 83.0	800F9 800F9	0.001 0.001	294 294	47.1 52.8	5.5 5.5	V H	1060
F	33°-52'-00" N 116-25-57 W	Local Government	G	957.80	235.0	100F9	0.0002	unk	53.0	18.6	V	1540
G	33°-49'-21" N 116-30-33 W	Local Government	F	954.20	55.0	100F9	0.0002	unk	53.0	18.6	V	415
H	33°-48'-59" N 116-24-25 W	Railroad	I	953.90	120.5	100F9	0.0005	220	53.8	12.0	V	240
I	33°-43'-07" N 116-12-31 W	Railroad	H K *	957.50 6585.00 6605.00	300.6 301.1 130.2	100F9 10000F9 10000F9	0.0005 0.0200 0.0200	unk unk unk	46.8 70.9 69.8	19.0 1.3 1.0	V H V	180

*Out of Study Area

MICROWAVE TRANSMITTERS

SITE	LOCATION (Latitude/ Longitude)	USE	RECEIVER LOCATION	FREQUENCY (MHz)	AZIMUTH	EMISSION	FREQUENCY TOLERANCE	ANTENNA GAIN	ERP ¹	BEAM WIDTH	POLAR- ² IZATION	ANTENNA ³ HEIGHT
J	33°-55'-40" N 116-58-57 W	Railroad	* *	6585.00 6605.00	337.8 221.3	10000F9 10000F9	0.02 0.02	unk unk	68.8 72.9	1.7 1.0	V H	2575
K	33°-55'-23" N 116-36-58 W	Railroad	I J	6745.00 6765.00	121.1 268.4	10000F9 10000F9	0.02 0.02	unk unk	70.2 74.1	1.7 1.0	H H	1700
L	33°-47'-13" N 116-27-51 W	Power	M ? *	1855.00 1895.00 6605.00	328.5 310.7 108.0	2720F9 2720F9 10000F9	0.001 0.001 0.005	unk unk unk	51.1 54.1 71.0	9.5 6.0 1.3	V V H	304
LSM	33°-56'-08" N 116-34-30 W	Power Business	L	1915.00	148.5	2720F9	0.001	252	51.2	8.8	V	1090
N	33°-55'-26" N 116-36-58 W	Local Government	p Q O	1875.00 1885.00 1905.00	270.9 122.4 139.3	8000F9 8000F9 8000F9	0.001 0.001 0.001	287 287 287	62.0 62.0 62.0	6.0 6.0 6.0	H H V	1734
O	33°-49'-20" N 116-30-41 W	Local Government	N	1985.00	319.4	8000F9	0.001	287	62.0	6.0	V	412
P	33°-55'-37" N 116-52-26 W	Local Government	N *	1955.00 1975.00	90.9 263.1	8000F9 8000F9	0.001 0.001	287 287	61.0 61.0	6.0 6.0	H V	2347
Q	33°-42'-48" N 116-13-12 W	Local Government	* N	1955.00 1965.00	106.5 302.6	8000F9 8000F9	0.001 0.001	287 287	61.2 61.2	6.0 6.0	V H	155

*Out of Study Area

MICROWAVE TRANSMITTERS/RECEIVERS

SITE	LOCATION (Latitude/ Longitude)	USE	RECEIVER LOCATION	FREQUENCY (MHz)	AZIMUTH	EMISSION	FREQUENCY TOLERANCE	ANTENNA GAIN	ERP ¹	BEAM WIDTH	POLAR- ² IZATION	ANTENNA ³ HEIGHT
R	33°-51'-58" N 116-26-03 W	Common Carrier	T, U, V, W, X, Y, Z	5945-11115	5.9	24000F9	.02000	unk	unk	2 ⁴	H,V	1581
S	33°-43'-13" N 116-22-11 W	Common Carrier	S (KD45) K	11605.0	339.8	28000F9	.005	unk	unk	1 ⁴	H	254
T	33°-44'-03" N 116-23-32 W	Common Carrier	KMIR	10875	165.1*	28000F9	.005	unk	Receive only	1.5 ⁴	H	237
U	33°-48'-38" N 116-22-46 W	Common Carrier	Thousand Palms	5945-6153	140.5*	24000F9	.02	unk	Receive only	2 ⁴	V,H	222
V	33°-42'-29" N 116-12-29 W	Common Carrier	Indio	5945-11035	129.9*	24000F9 26000F9	.05	unk	Receive only	2 ⁴	V,H	75
W	unk	Common Carrier	Palm Desert	5945-10835	159.7*	24000F9 26000F9 28000F9	.005 .005 .005	unk unk unk	Receive only	2 ⁴	H,V H H	unk
X	33°-46'-20" N 116-26-45 W	Common Carrier	Cathedral	5945-11115	185.9*	24000F9	-	unk	Receive only	2 ⁴	H,V	302
Y	33°-58'-31" N 116-30-03 W	Common Carrier	Desert Hot Spr.	5945-6153	333.0	24000F9	-	unk	Receive only	2 ⁴	H,V	261
Z	33°-50'-16" N 116-32-32 W	Common Carrier	Palm Springs	5945-6153	252.6	24000F9	-	unk	Receive only	2 ⁴	H,V	560

*Out of Study Area

MICROWAVE TRANSMITTERS

SITE	LOCATION (Latitude/ Longitude)	USE	RECEIVER LOCATION	FREQUENCY (MHz)	AZIMUTH	EMISSION	FREQUENCY TOLERANCE	ANTENNA GAIN	ERP ¹	BEAM WIDTH	POLAR- ² IZATION	ANTENNA ³ HEIGHT
AA	34°-02'-17" N 116-48-47 W	Common Carrier	R	8227-11285	118.4	28000F9	-	unk	Receive only	2.0 ⁴	H,V	1813
BB	34°-02'-17" N 116-48-49 W	Local Government	*	6725.00	197.0	10000F9	0.005	unk	65.0	2.5	V	7922
			*	6785.00	234.2	10000F9	0.005	unk	76.0	1.0	H	
			CC	5825.00	121.0	10000F9	0.005	unk	75.0	1.3	H	
CC	33°-45'-12" N 116-16-37 W	Local Government	BB	6705.00	301.0	10000F9	0.005	unk	76.0	1.0	H	65
			*	6725.00	111.2	10000F9	0.005	unk	65.0	2.5	H	
DD	33°-54'-44" N 116-59-47 W	Domestic Public Fixed Radio Service	*	10895	283.1	40000F9Y	.00500	44.0	unk	1.1	V	2891
			*	11055	283.1	40000F9Y	.00500	44.0	unk	1.1	V	2891
			*	10735	283.1	40000F9Y	.00500	44.0	unk	1.1	V	2891
			*	11135	283.1	40000F9Y	.00500	44.0	unk	1.1	V	2891
			*	10775	283.1	40000F9Y	.00500	44.0	unk	1.1	H	2891
			*	6123.1	283.1	30000F9Y	.00500	38.8	unk	1.8	V	2891
			*	59.45.2	283.1	30000F9Y	.00500	38.8	unk	1.8	V	2891
			EE	10795	81.4	40000F9Y	.00500	44.0	37.0	1.1	V	2891
			EE	10875	81.4	40000F9Y	.00500	44.0	37.0	1.1	V	2891
			EE	10955	81.4	40000F9Y	.00500	44.0	37.0	1.1	V	2891
			EE	11035	81.4	40000F9Y	.00500	44.0	37.0	1.1	V	2891
			EE	5945.2	81.4	30000F9Y	.00500	41.3	32.0	1.4	H	2891
			EE	6004.5	81.4	30000F9Y	.00500	41.3	32.0	1.4	H	2891

*Out of Study Area

MICROWAVE TRANSMITTERS

SITE	LOCATION (Latitude/ Longitude)	USE	RECEIVER LOCATION	FREQUENCY (MHz)	AZIMUTH	EMISSION	FREQUENCY TOLERANCE	ANTENNA GAIN	ERP ¹	BEAM WIDTH	POLAR- ² IZATION	ANTENNA ³ HEIGHT
SE	33°-57'-17" N 116-33-15 W	Domestic Public Fixed Radio Service	DD	11325	261.6	40000F9Y	.005	46.5	37.0	0.8	V	2813
			DD	11485	261.6	40000F9Y	.005	46.5	37.0	0.8	V	2813
			DD	11565	261.6	40000F9Y	.005	46.5	37.0	0.8	V	2813
			DD	11645	261.6	40000F9Y	.005	46.5	37.0	0.8	V	2813
			DD	6197.2	261.6	30000F9Y	.005	41.3	32.0	1.4	H	2803
			DD	6256.5	261.6	30000F9Y	.005	41.3	32.0	1.4	H	2803
			GG	11485	140.6	40000F9Y	.005	46.5	37.0	0.8	V	2803
			GG	11605	140.6	40000F9Y	.005	46.5	37.0	0.8	H	2803
			GG	11445	140.6	40000F9Y	.005	46.5	37.0	0.8	H	2803
			GG	11525	140.6	40000F9Y	.005	46.5	37.0	0.8	H	2803
			GG	6197.2	140.6	30000F9Y	.005	38.8	32.0	1.8	H	2793
			GG	6256.5	140.6	30000F9Y	.005	38.8	32.0	1.8	H	2793
			FF	11245	231.5	28000F9Y	.05	48.4	27.0	1.1 ⁴	V	2780
			FF	11405	231.5	28000F9Y	.05	48.4	27.0	1.1 ⁴	V	2780
			FF	11485	231.5	28000F9Y	.05	48.4	27.0	1.1 ⁴	H	2780
FF	33°-50'-32" N 116-49-24 W	Domestic Public Fixed Radio Service	EE	10955	51.4	28000F9Y	-	47.5	27.0	1.1 ⁴	V	5091
			EE	10715	51.4	28000F9Y	-	47.5	27.0	1.1 ⁴	H	5091
			EE	10875	51.4	28000F9Y	-	47.5	27.0	1.1 ⁴	H	5091
			EE	11115	51.4	28000F9Y	-	47.5	27.0	1.1 ⁴	V	5091
								47.5	27.0	1.1 ⁴	V	5091

*Out of Study Area

MICROWAVE TRANSMITTERS

SITE	LOCATION (Latitude/ Longitude)	USE	RECEIVER LOCATION	FREQUENCY (MHz)	AZIMUTH	EMISSION	FREQUENCY TOLERANCE	ANTENNA GAIN	ERP ¹	BEAM WIDTH	POLAR- ² IZATION	ANTENNA ³ HEIGHT
GG	33°-49'-35" N 116-51-41 W	Domestic Public Fixed Radio Service	EE	11035	320.7	40000F9Y	.00500	UNK	37.0	1.1 ⁴	V	480
			EE	10835	320.7	40000F9Y	.00500	UNK	37.0	1.1 ⁴	H	480
			EE	10995	320.7	40000F9Y	.00500	UNK	37.0	1.1 ⁴	H	480
			EE	11075	320.7	40000F9Y	.00500	UNK	37.0	1.1 ⁴	H	480
			EE	5945.2	320.7	30000F9Y	.00500	UNK	32.0	1.1 ⁴	H	480
			EE	6004.5	320.7	30000F9Y	.00500	UNK	32.0	1.1 ⁴	H	480
			HH	10875	5.3	40000F9Y	.00500	48.4	32.0	0.7	H	480
			HH	10955	5.3	40000F9Y	.00500	48.4	32.0	0.7	H	480
			HH	10795	5.3	40000F9Y	.00500	48.4	32.0	0.7	H	480
			EE	10755	320.7	28000F9Y	.05000	UNK	37.0	1.1 ⁴	V	480
			EE	10915	320.7	28000F9Y	.05000	UNK	37.0	1.1 ⁴	V	480
			EE	11175	320.7	28000F9Y	.05000	UNK	37.0	1.1 ⁴	H	480
HH Passive reflector)	34°-07'-02" N 116-29-44 W	Domestic Public Fixed Radio Service	Yucca	10875	86.9	N/A	N/A	123.72	N/A	N/A	H	4318
			Valley	10955	86.9	N/A	N/A	123.72	N/A	N/A	H	4318
				10795	86.9	N/A	N/A	123.72	N/A	N/A	H	4318
			GG	11405	185.3	N/A	N/A	123.72	N/A	N/A	H	4318
			GG	11645	185.3	N/A	N/A	123.72	N/A	N/A	H	4318
			GG	11325	185.3	N/A	N/A	123.72	N/A	N/A	H	4318
Yucca alley	34°-07'-15" N 116-24-57 W	Domestic Public Fixed Radio Service	HH	11405	266.9	40000F9Y	.00500	49.8	.05	.05	V	3352
			HH	11645	266.9	40000F9Y	.00500	49.8	.05	.05	V	3352
			HH	11325	266.9	40000F9Y	.00500	49.8	.05	.05	V	3352

*Out of Study Area

MICROWAVE TRANSMITTERS

SITE	LOCATION (Latitude/ Longitude)	USE	RECEIVER LOCATION	FREQUENCY (MHz)	AZIMUTH	EMISSION	FREQUENCY TOLERANCE	ANTENNA GAIN	ERP ¹	BEAM WIDTH	POLAR- ² IZATION	ANTENNA ³ HEIGHT
I	33°-54'-49" N 116-59-50 W	Domestic Public Fixed Radio Service	K K K K K K	6034.15 6152.75 6034.15 6063.8 6093.45 6152.75	88.19 88.19 88.19 88.19 88.19 88.19	30000F9 30000F9 30000F9 30000F9 30000F9 30000F9	unk unk unk unk unk unk	41.0 41.0 41.0 41.0 41.0 41.0	37.0 37.0 37.0 37.0 37.0 37.0	2 ⁴ 2 ⁴ 2 ⁴ 2 ⁴ 2 ⁴ 2 ⁴	V H H H V V	2825 2825 2825 2825 2825 2825
K	33°-55'-23" N 116-36-58 W	Domestic Public Fixed Radio Service	II II II II II II	6286.19 6404.79 6286.19 6315.84 6345.49 6404.79	268.4 268.4 268.4 268.4 268.4 268.4	30000F9 30000F9 30000F9 30000F9 30000F9 30000F9	unk unk unk unk unk unk	43.2 41.0 41.0 43.2 43.2 43.2	37.0 37.0 37.0 37.0 37.0 37.0	2 ⁴ 2 ⁴ 2 ⁴ 2 ⁴ 2 ⁴ 2 ⁴	V V V H V V	1755 1755 1755 1755 1755 1755
			I I I I I I	11385.0 11385.0 11625.0 11225.0 11465.0 11225.0	120.9 120.9 120.9 120.9 120.9 120.9	30000F9 30000F9 30000F9 30000F9 30000F9 30000F9	unk unk unk unk unk unk	49.8 46.4 49.8 49.8 49.8 46.4	37.0 37.0 37.0 37.0 37.0 37.0	1.1 ⁴ 1.1 ⁴ 1.1 ⁴ 1.1 ⁴ 1.1 ⁴ 1.1 ⁴	H H H H H H	1755 1755 1755 1755 1755 1755
I**	33°-43'-07" N 116-12-31 W	Domestic Public Fixed Radio Service	K K K K K K	10935.0 11015.0 11175.0 10935.0 10775.0 10775.0	301.1 301.1 301.1 301.1 301.1 301.1	30000F9 30000F9 30000F9 30000F9 30000F9 30000F0	unk unk unk unk unk unk	48.3 49.8 49.8 49.8 48.3 49.8	37.0 37.0 37.0 37.0 37.0 37.0	1.1 ⁴ 1.1 ⁴ 1.1 ⁴ 1.1 ⁴ 1.1 ⁴ 1.1 ⁴	V V V V V V	135 135 135 135 135 135

¹ERP - Effective Radiated Power; ²V - Vertical, H - Horizontal; ³Feet above mean sea level; ⁴Nominal beam width presumed

SOURCE: FCC list of Licensed Microwave Transmitters for
Riverside County (microfiche)

*Out of Study Area **I and K are listed twice because they are multiple use facilities.

INDEX

Access Roads: S-1, S-2, 1-6, 2-9, 2-17, 2-21, 2-24, 2-28, 2-31, 2-34,
2-39, 2-43, 2-46, 2-48, 2-50, 2-54
Recreation Impacts: 4-1 to 6, passim; 4-72
Visual Impacts: 4-8 to 16, passim;
ACEC's:
Big Morongo Canyon: 1-7, 4-26
White Water Canyon: 1-7, 3-1, 4-4, 4-5, 4-7, 4-8, 4-10, 4-23, 4-25,
4-26, 4-27, 4-31, 4-32, 4-33, 4-34, 4-35, 4-51, 4-52, 4-65, 4-67
Aesthetics: Visual Resources
Air Quality: 1-8
Alternatives:
Alternative 1: S-2, S-8, 2-1, 4-2, 4-59, 4-60, 4-61, 4-74 to 4-81,
Alternative 2: S-4, S-8, S-10, 2-54, 4-59, 4-61, 4-62
Alternative 3: S-4, S-9, 2-55, 4-84
BLM Preferred Alternative: S-10, 2-65
Analyses Guidelines: 4-1
Applicants' Proposed Action: See Alternatives
Archaeological Resources: See Cultural Resources
Bear Sterns/Bendix: S-3, 2-23, 4-4, 4-12, 4-33, 4-42, 4-49, 4-70, 4-75
Bendix WtG: 2-23
Biological Resources: S-6, 3-11, 4-21 to 36, 4-75
Boeing: S-2, 5-3, 2-20, 4-4, 4-12, 4-32, 4-38, 4-39, 4-42, 4-44, 4-49
California Energy Commission: 1-1, 1-3, 2-64
California Public Utilities Commission: 2-11, 2-55
California Desert Conservation Area and Plan: S-4, S-11, 1-6, 1-7, 2-55,
2-65
Carter Wino Generator:
Model 25: 2-42
Model 125: 2-42
City of Riverside: S-1, S-4, S-8, 2-47, 2-63, 4-7, 4-16, 4-35
Communications Interference:
Microwave: 3-22, 4-43
Television: 3-22, 4-44, 4-48, 4-70
FM Radio: 3-22
Two-way Radio: 3-22
VORTAC: 3-22, 4-48, 4-49
Construction Activities: 2-5, 2-14, 2-21, 2-24, 2-28, 2-29, 2-32, 2-37,
2-43, 2-47, 2-50, 4-36, 4-37, 4-49, 4-70
Consumption (of Energy): See Energy Demand
Council on Environmental Quality: S-2, 1-4
Cultural Resources: S-8, 1-6, 3-23, 4-49
Archaeological: 3-23, 4-49, 4-50
Native American: 3-24, 4-49, 4-50
DAF Indal: 2-35, 4-42
Eoom Hill: 3-2, 3-5, 3-7, 3-22, 3-23, 4-44, 4-47, 4-50, 4-75, 4-78
Electricity Rates: 4-52 to 56, passim, 4-79 to 83, passim
Employment: 3-26, 4-52 to 56 passim, 4-79 to 83 passim
Ethnographic Resources: See Cultural Resources:

Fault Rupture: 3-7
 FLPMA: S-11, 1-7, 1-9, 2-64, 2-65
 Federal Aviation Administration: 1-4, 2-64, 4-48
 Federal Communication Commission: 2-64
 Federal Energy Regulatory Commission: 2-64
 Flood Control: 2-21, 2-31, 2-64, 3-9, 4-20
 Flood Plains: S-6, S-10, 2-6, 3-8
 Flood Proneness: S-6, 1-6, 3-9, 4-19
 Geotechnical Situation: 3-6, 4-17
 Hamilton Standard WTS-4: 2-2, 2-35
 Habitat Types: 3-11, 4-25, 4-31
 Housing: S-8, S-9, 3-26, 4-49, 4-50
 Hyorology: 3-8, 4-19
 Indian Tribes and Councils: 3-25
 Issues: S-2, S-9, 1-4
 Landsliding: 3-6
 Lano Use: S-2, S-4, S-8, 1-5, 3-1, 4-2, 4-70
 Laws and Policies:
 Endangereoo Species Act: S-10
 National Environmental Policy Act of 1969: 1-1, 1-4, 1-7
 Management Goals 1-7
 Merkhams 2000: 2-50
 Meteorological Towers: 2-37, 2-47
 Microwave Communication Stations: 4-43 to 4-45
 Mitigation Measures: 2-55, 4-58 to 69
 MOD-2: 2-1, 2-20, 2-42, 2-47, 4-38, 4-39, 4-44
 Native American Resources: See Reservations
 Natomas Energy Company: 2-54
 Need for Project: S-1, 1-1
 Noise:
 General: S-2, S-7, 1-4, 3-22, 4-36, 4-36 to 43
 Construction: 4-36
 Operation: 4-37
 "Thumping": 4-38
 Pan Aero: 2-34, 2-61, 4-5, 4-13, 4-344-42, 4-50, 4-54, 4-71, 4-78, 4-82
 Permitting Procedures: 1-8, 2-55
 Population Centers: 3-25
 Power Output: S-1, S-4, 2-7, 2-15, 2-22, 2-36, 2-44, 2-49, 2-53,
 2-58 to 63
 Public Cost & Revenue: S-10, S-8, S-9, 1-3, 3-27, 4-51 to 57 passim, 4-79
 to 83 passim
 Purpose of Project: S-1, 1-1
 Rare, Threatened, Endangered Species: 3-13, 3-15, 3-18, 4-24, 4-27, 4-32,
 4-34, 4-36, 4-65, 4-76 to 78
 Recreation: 3-1, 4-2 to 4-6, 4-70 to 72
 Reservations (Native American):
 Riparian: 3-11, 3-12, 3-13, 3-17, 3-21, 4-24, 4-27, 4-31, 4-34, 4-77
 Riverside, County of: S-2, S-10, 1-4, 1-8, 4-37, 4-39, 4-41, 4-51 to 57
 passim, 4-79 to 83 passim
 Safety: S-2, S-6, 1-4, 2-2, 2-5, 2-14, 2-24, 2-26, 2-29, 2-32, 2-37,
 2-42, 2-43, 2-50, 4-84
 San Gorgonio Farms: 2-40, 2-62, 4-6, 4-16, 4-35, 4-43, 4-50, 4-56, 4-72
 4-75, 4-78, 4-82

Scoping: S-2, 1-4
 Sedimentation: 4-19
 Smart and Company: 2-50, 4-7, 4-16, 4-35, 4-43, 4-50, 4-57, 4-72, 4-78
 Social and Economic Conditions: 3-25, 4-51 to 58, 4-78 to 83
 Soils: 3-7
 Southern California Edison Company: S-10, 1-1, 1-2, 2-19, 2-60, 4-4,
 4-12, 4-32, 4-49, 4-53, 4-781, 4-74, 4-77, 4-81
 Standard Operating Procedures: 2-64
 Tourism: S-8, S-9
 Transmission Lines: 2-9, 2-17, 2-23, 2-24, 2-28, 2-31, 2-34, 2-35, 2-43,
 2-48, 2-50, 4-8, 4-9, 4-15, 4-23
 Two-Way Radio: See Communications Interference
 USW 56-50: 2-12
 U.S. Windpower: 2-11, 2-59, 4-3, 4-10, 4-13, 4-31, 4-49, 4-52, 4-70,
 4-73, 4-77, 4-29
 Vegetation: 3-11, 4-21
 Ventus: 2-31, 4-5, 4-13, 4-33, 4-42, 4-50, 4-54, 4-71, 4-74, 4-77, 4-81
 Ventus WTG: 2-31
 Visual Mitigations: 4-60 to 62
 Visual Resources: 3-2, 4-7 to 16, 4-72 to 76
 WECS Tech: 2-26, 4-5, 4-13, 4-33, 4-71, 4-74, 4-77, 4-81
 Westinghouse: 2-28, 2-35, 4-5, 4-13, 4-33
 Wilderness: S-5, S-10, 3-2, 4-3, 4-4, 4-6
 Wildlife:
 Coachella Valley Fringe-toed Lizard: S-2, S-7, S-10, 3-19, 4-24,
 4-27, 4-28, 4-32, 4-33, 4-34, 4-34, 4-36, 4-77
 Desert Bighorn Sheep: 3-21, 4-31, 4-32, 4-35, 4-36
 Flat-tailed Horned Lizard: 3-20, 4-27, 4-31
 Least Bell's Vireo: 3-21, 4-31, 4-35, 4-77
 Migratory Birds: 3-15, 4-22, 4-23, 4-26, 4-76
 Raptors: 3-16, 4-23, 4-26
 Shorebirds and Waterfowl: 3-16, 4-26, 4-76
 Wind Access and Equity: S-2, 1-5, 2-55, 2-56, 2-57, 4-59
 Windfarms Ltd.: 2-1, 2-58, 4-2, 4-7, 4-26, 4-49, 4-51, 4-70, 4-72, 4-76,
 4-75
 Windy Point: 2-50, 2-51, 2-53, 3-2, 3-4, 3-5, 3-20, 3-22, 3-24, 4-7,
 4-14, 4-32, 4-35, 4-36, 4-81, 4-43, 4-49, 4-50, 4-71, 4-22, 4-77

BLM LIBRARY
RS 150A BLDG. 50
DENVER FEDERAL CENTER
P.O. BOX 25047
DENVER, CO 80225

Bureau of Land Management
Library
Bldg. 50, Denver Federal Center
Denver, CO 80225

R'S CARD

2 v. 1 Management
t environmental
t on the San

OFFICE	DATE RETURNED			

(Continued on reverse)

TJ 825 .S26 1982 v.1
U.S. Bureau of Land Management
California Draft environmental
impact statement on the San

BLM LIBRARY
RS 150A BLDG. 50
DENVER FEDERAL CENTER
P.O. BOX 25047
DENVER, CO 80225

